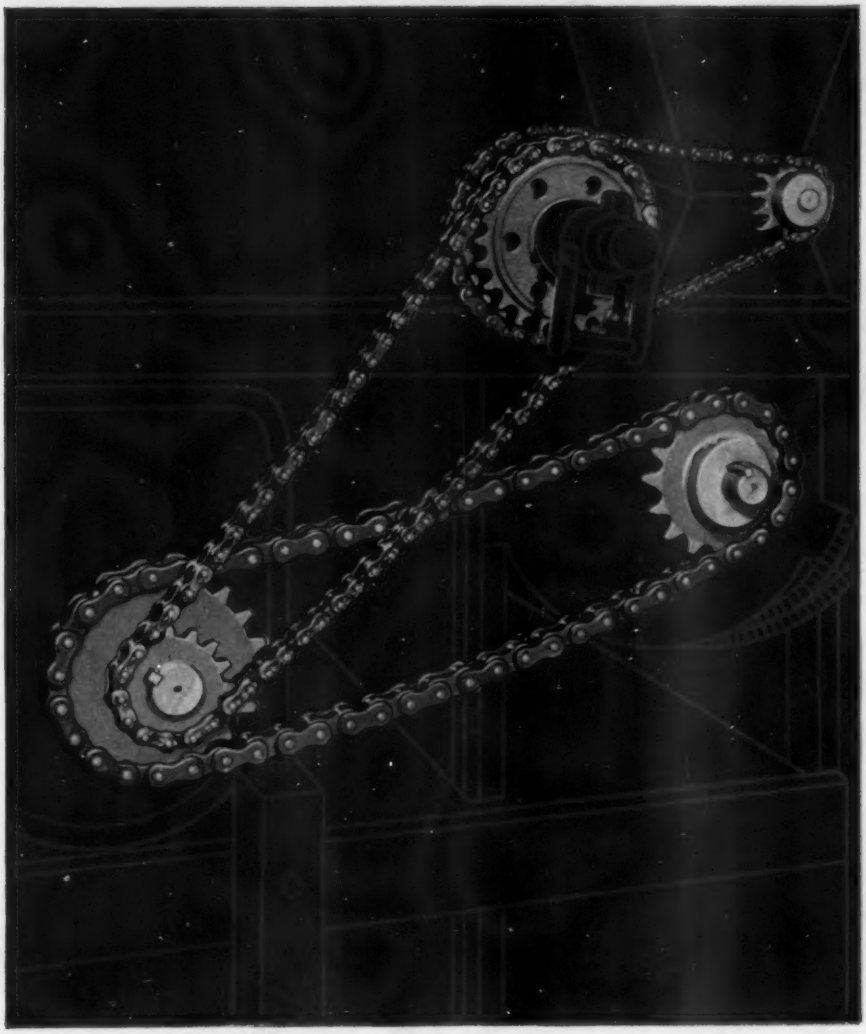
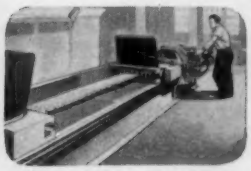
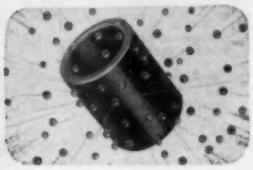
In roller chain . . . EXTRAS* like these give you extra reliability



LOCK-TYPE BUSHINGS (applied on a range of sizes) end a cause of stiff chain.



PRE-STRESSING of multiple width chain provides uniform load distribution.



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'ROUND ABOUT with the editors in field and office

Edited by R. L. Marinello

Pittsburgh Club Honors Hiller

R. W. Hiller, recently elected President of the American Institute of Plant Engineers, is shown in the photograph below adding another pin, which designates a new member, to the growing list of 1500 Plant Engineers scattered across the United States and Canada.

Bob Hiller, Plant Engineer of Dravo Corp., has contributed much to the growth of the American Institute of Plant Engineers. He has also been very active in his local chapter, the Plant Engineers' Association of Pittsburgh. He is a charter member and past president of his local chapter.

Bob Hiller, newly elected President of the AIPE, places another pin on map

To show their appreciation for the work he has done in their own club and also to honor his new position with the AIPE, members of the Pittsburgh Club had a testimonial dinner in Bob's honor on March 28.

Course in Industrial Safety

To meet the increasing need of industry for continued safety programs and practices, a home study course in Industrial Safety Engineering has been added to the curriculum of International Correspondence Schools.

Prepared especially for home study, the Industrial Safety Engineering Course is designed to help industrial supervisors in charge of safety, industrial engineers who desire safety training, safety representatives of labor departments and those whose responsibilities would call for a knowledge of safety practices in industry.

Comprised of 41 lessons requiring an estimated average study time of 650 hours, the course provides instruction in mathematics, machine sketching, blueprint reading, industrial psychology, handling of materials, plant and production equipment layout and safety principles and practices.

Readers interested in this course should direct their inquiry to International Correspondence Schools, Scranton 9, Pennsylvania.

How Does Your Garden Grow?

It is time for "green-thumb" engineers to sharpen up their shrubs and trees in getting ready for the Fourth Annual Industrial Landscaping Awards.

Any industrial company, business firm, service organization, institution or its authorized representative, may enter this competition. This year's competition ends September 1, 1956.

Awards will be based on 8 by 10 in. glossy photographs taken from the front of the building or buildings, or from whatever angle will best picture the landscaping design and planting.

Accompanying the photographs should be a brief description of the planting, including the name of the company and address of the building or buildings, as well as the names of the people who did the landscaping.

A folder describing these awards will be sent upon request to the American Association of Nurserymen, 10 East 43rd Street, New York 17, N. Y.

Material Handling Conference

Program for the third annual two-week Material Handling Training Conference will be divided into three major areas: Material Handling Equipment; Analysis and Systems Design; and Operational Problems. It will be conducted at the Lake Placid Club, New York, from June 17 to June 30.

The first phase will cover the selection of material handling equipment, its maintenance and possible replacement.

The second phase will analyze a problem, plan a system and prepare a material handling layout. Design will cover construction features to consider, unit load principles, warehousing theory and practice.

Operational problems will consider cost control, organizing a material handling

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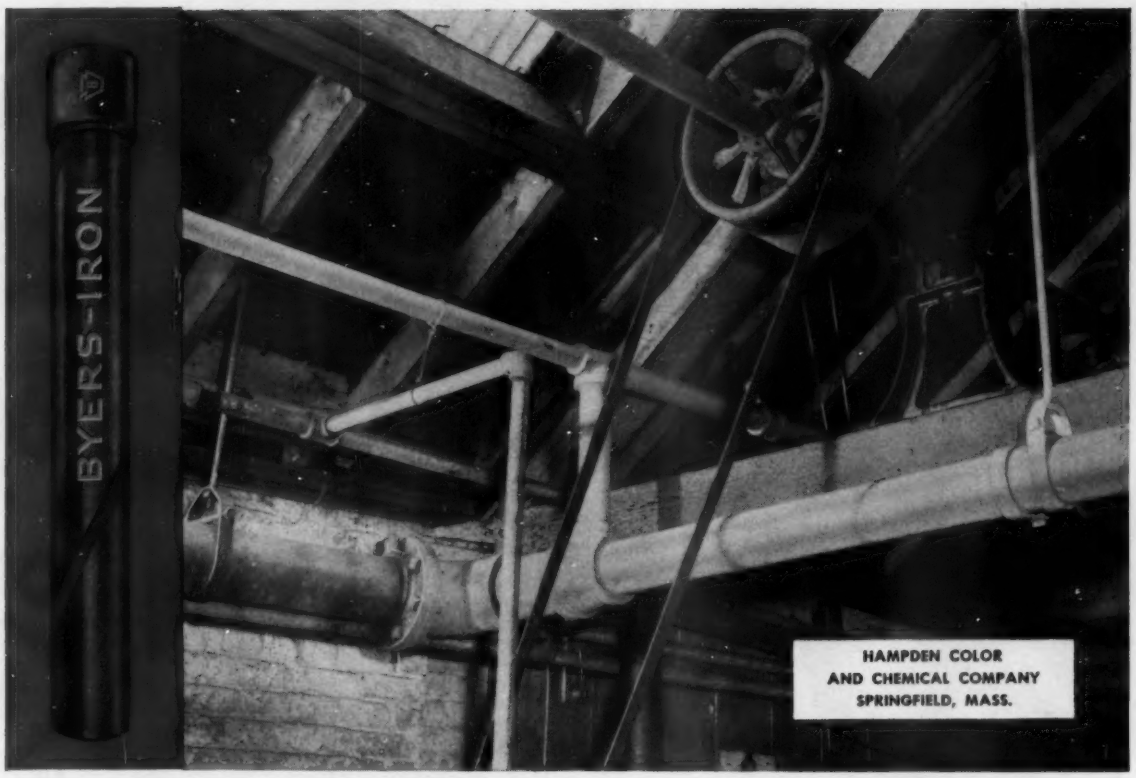

This WROUGHT IRON PIPE installation has SAVED the cost of 4 replacements... *and it's still going strong*

In 1941, the Plant Superintendent of Hampden Color & Chemical Company, Springfield, Massachusetts, started looking for an answer to a recurring piping failure problem.

His maintenance records charted the life-span of the piping material he had been using for the dry-sprinkler-pipe system at about three years. There was no question about the severe corrosive conditions that constantly threatened the service. The system, located on the ceiling of the dye room, collected dye dust which contained a large percentage of sodium chloride. Condensation created by the operation in the dye room kept the pipes wet. The result was a weak "salt bath" which caused outside corrosion.

After careful investigation of performance records in services where corrosive conditions were similar to those affecting his sprinkler-lines, the Plant Superintendent selected wrought iron pipe for replacement. The first quantity was installed in 1941, followed by a greater tonnage in 1943.

The installation was recently checked. Records reveal that the wrought iron pipe has given trouble-free service, and is still in good condition.

The economies are clear. Figured in years of service, the wrought iron pipe has already saved the cost of 4 to 5 replacements. Added to this are the benefits of uninterrupted operation that means greater plant efficiency.

The economical performance of wrought iron paved the way for extended use of the material by Hampden Color & Chemical Company. Domestic water lines, boiling tank piping, and more recently, a new smokestack, are all safeguarded with time-tested wrought iron.

Our bulletin, *Piping for Permanence*, tells the story of wrought iron, why it resists corrosion longer, and illustrates the many applications where it is serving and saving. Write for your copy.

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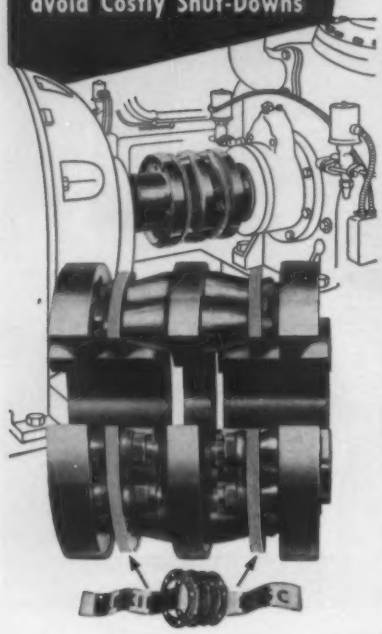

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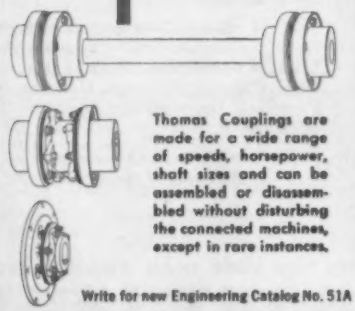
CAN NOT "CREATE" THRUST	Free End Float under Load and Misalignment. No Rubbing Action to cause Axial Movement.
PERMANENT TORSIONAL CHARACTERISTICS	Drives Like a Solid Coupling. Elastic Constant Does Not Change. Original Balance is Maintained.



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'ROUND ABOUT

system, communications, suggestions for old and multi-story buildings and trouble-shooting in material handling.

Enrollment for the course will take place on June 17. Students will complete the course on June 30. The cost of this training program is $850, which covers room, board, tuition fees and supplies.

Further information on this conference may be obtained by writing to James R. Bright, Director, Material Handling Training Conference, 56 Robbins Road, Lexington, Massachusetts.

Fire Extinguisher Service

INDUSTRIES IN and around the Cleveland, Ohio, area have "at your door" service on any type of fire extinguisher. The service is provided by the Atomic Fire Extinguisher Co. of Cleveland, which operates a fleet of three trucks. The trucks make regular rounds of industrial clients to service their fire fighting equipment.

Equipment carried inside the trucks includes high-pressure pumps and testing devices. In addition to providing on-the-spot servicing, this mobile equipment also reduces the time that a plant is left unprotected.

Electron Tube Service

AN ELECTRON tube information service has been established by the National Bureau of Standards for accumulating and disseminating technical data on both domestic and foreign radio tubes.

With this service, it is possible to find (1) information about any particular tube, (2) all tube types whose electrical characteristics, bulb sizes, or base configurations fall within particular ranges, and (3) domestic tubes that can be substituted for unavailable foreign tubes. Recently, junction diodes and transistors have been added to the program.

Anyone who would like to take advantage of this service should direct their inquiries to C. P. Marsden, Chief, Electron Tubes Section, National Bureau of Standards, Washington 25 D.C.

Plant Engineer Promoted

H. E. Thornton was recently appointed chief engineer of the Bound Brook Oil-Less Bearing Co. Bound Brook, N. J. He formerly held the position of plant engineer at this plant.

Prior to joining the Bound Brook company in 1945, Mr. Thornton spent ten years with the Western Electric Co., at the Kearny, N. J., plant where he developed a continuous mica coating process.

Plant Engineer Promotions

Arthur G. Thayer has been named plant engineer of the Rossford, Ohio, plant of Libbey-Owens-Ford Glass Co. He holds a degree in mechanical engineering from Michigan State University. He joined the company in 1947 and has served as assistant plant engineer at Rossford for three years.

Alvin A. Augustine was recently promoted to assistant plant engineer. He began his career with Libbey-Owens-Ford at the East Toledo plant in 1932. A graduate from Purdue University as a chemical engineer, he came to the Rossford plant as a grinding and polishing mechanic in 1933 and since 1941 has been a foreman and assistant to the plant engineer.

Silver Quill Awarded to Charles F. Kettering

Recently, in Washington, Charles F. Kettering, General Motors Corp., was awarded a Silver Quill by the National Business Publications. Some of those at the head table included, l to r: N. McK. Kneisly, Irving-Cloud Pub. Co.; M. Isbell, Isbell's Restaurant; W. B. Barnes, Small Business Administration; R. H. Morris, Plant Engineering magazine; D. F. Beard, NIAA and Reynolds Aluminum Co.; L. Polk, Shiefield Corp.; Gen. R. Pate, U. S. Marine Corp.; and at the extreme right is H. B. Du Pont, E. I. du Pont de Nemours & Co.

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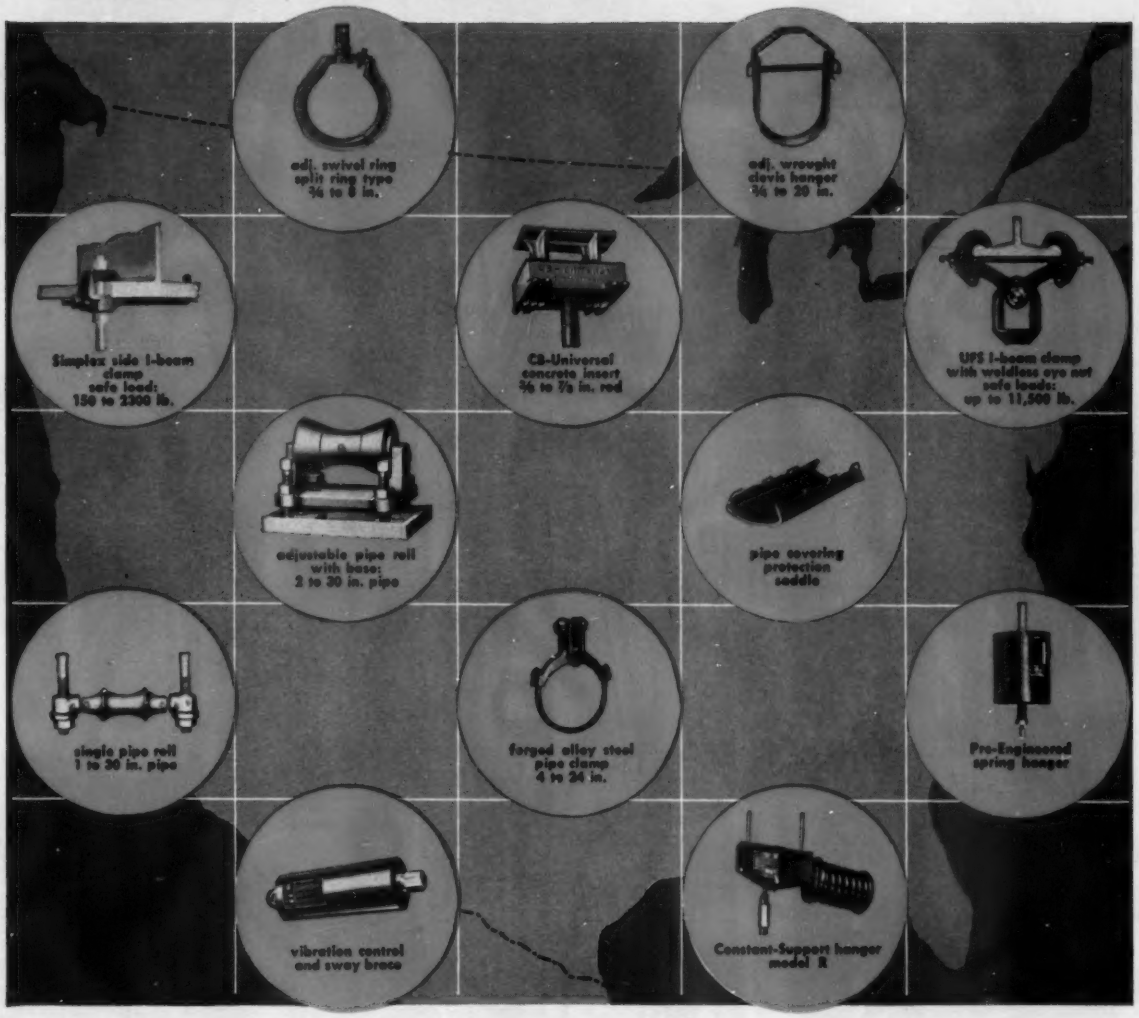
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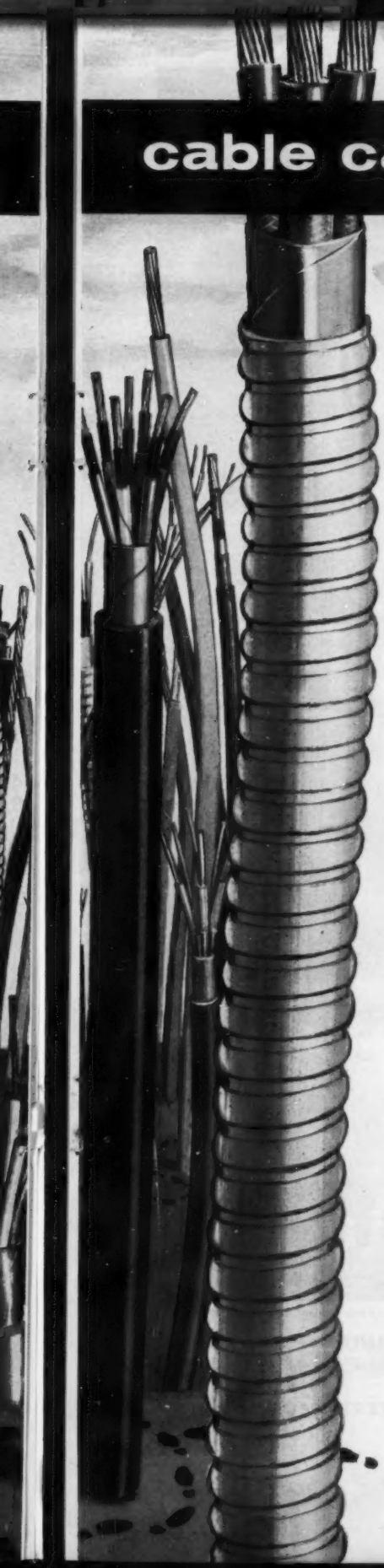
Why selecting the right

cable can be a big problem



You have a plant to wire. You know all the wiring requirements that have to be met. You have catalogs showing an endless variety of power and control cables to choose from. Sure you can pick a *good* one. But how do you unerringly select the *best* for your job? Mostly, it's experience that turns up the *best* from a selection of *good* possibilities. Your own experience is important, of course. And . . . in making the best selection, it's important to remember . . .

How General Electric Can Help You

General Electric has helped many engineers in leading electric utilities and industrial plants solve their wire and cable problems. This experience is at your disposal.

What's more General Electric wire and cable engineers have solved innumerable problems of the same kind which have developed in General Electric's own facilities. And, of course, General Electric knows the requirements of the connected equipment—transformers, load centers, motors, controls, etc. That's experience, too.

And, since the G-E line of cables covers almost every possible type and construction, these engineers can pick the one cable that will do a given job most efficiently, most economically.

Next time you have a wire and cable problem, why not call on General Electric engineers to help you? Their experience and the tested quality of G-E cables can become an important factor in the efficient operation of your plant.

Write for free information on the specific wire and cable problems that interest you. Address Section W179-464, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

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Their experience, plus years-ahead engineering by Chrysler, assures dependable, trouble-free air conditioning through the years.

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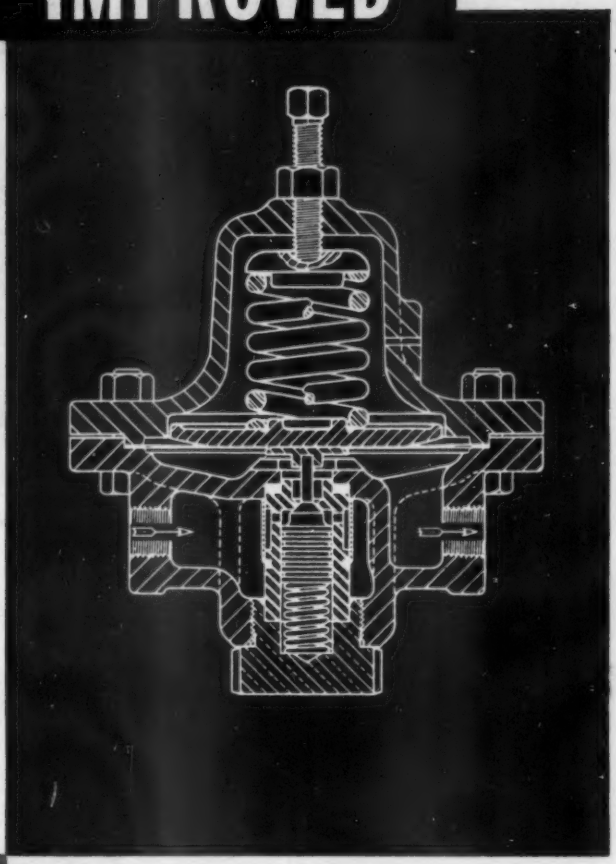

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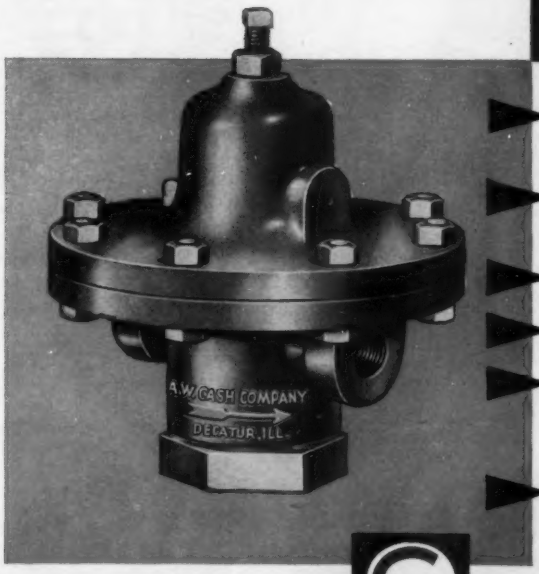

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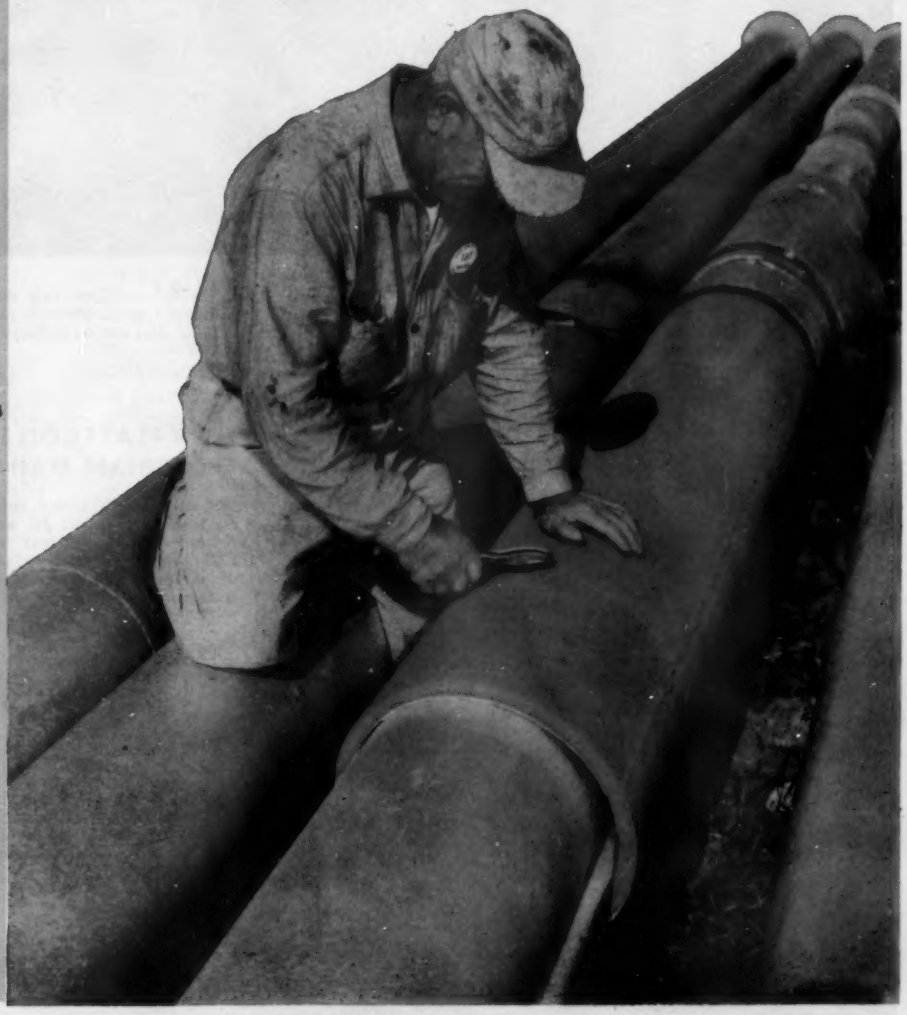
WRITE FOR YOUR COPY OF NEW SNAP•ON BROCHURE

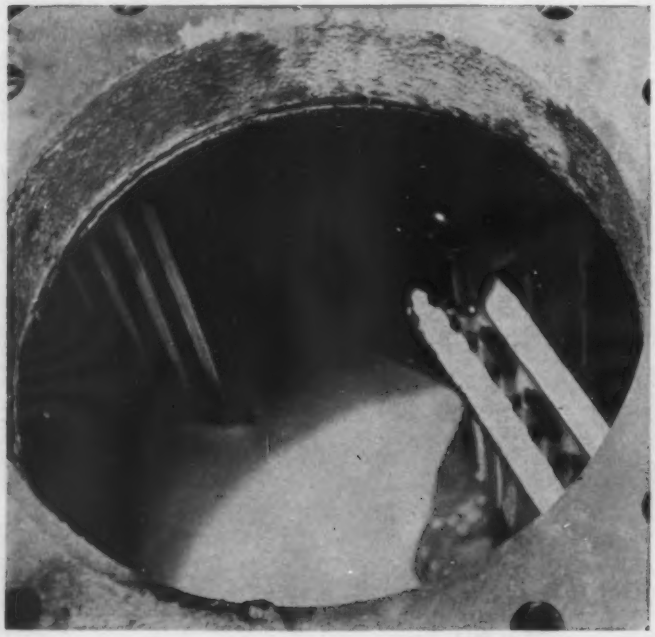
GUSTIN-BACON *Manufacturing Company*

244 W. 10th St., Kansas City, Mo.



For more facts circle 510 on Reply Card

MAINTENANCE SLASHED AT LINCOLN MERCURY New cars that are marred or scratched are "touched up" and run through this 150-foot paint-drying oven at the Lincoln-Mercury plant at Robertson, Mo. Heat comes from 44 Platecoils, each 22" wide and 119" long. An individual unit can be replaced in minutes without disturbing other units.

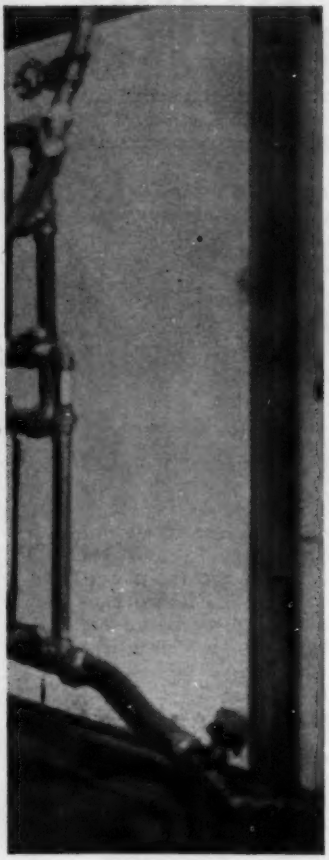


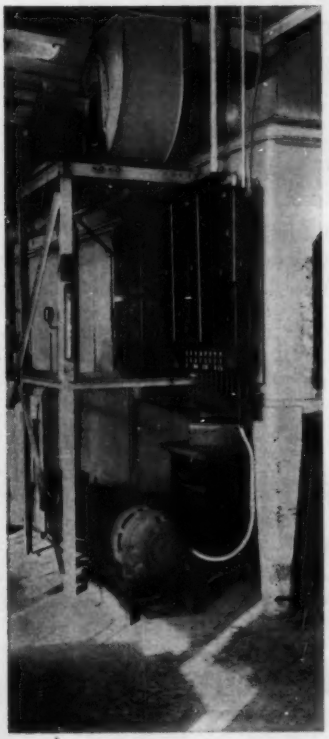
NEW PLATECOILS COST LESS THAN MAINTENANCE

Just removing the motor, agitator and bolted-down tank cover to get at pipe coil in a slurry cooling tank cost Sherwin-Williams Co. more than the price of Platecoils that do the job now. Platecoils can be installed through the manhole in the cover.

$1440 SAVED YEARLY AT BURROUGHS

Monthly cleaning of black iron pipe coils used for heating in a Parker Bonderite system cost Burroughs Corporation $1,440 a year. Electroplated Stainless Steel Platecoils required no cleaning in a year. In addition, heat up time was reduced from 2 hours to only 30 minutes.





Please send me the Platecoil story.

My problem is _____

_____

Name _____

Company _____ Title _____

Address _____

City _____ State _____

TRANTER PLATECOILS®

SAVE A LOT OF TIME AND SOME MONEY

Add up all the manhours you spend in engineering, fabricating, installing and maintaining pipe coils for process heating and cooling. When you use Tranter Platecoil heat transfer units, you eliminate engineering and fabricating time and drastically slash installation and maintenance time to make big savings. And frequently you can add more savings that come from increased tank capacity and a shorter operating cycle that Platecoil's compact size and extra efficiency make possible. Tranter Platecoils come in standard sizes and give dependable standardized performance. Delivered to you from factory-tested stock, they are ready to go to work for you when you get them. Installed on quick-change hangers, these lightweight compact units can be installed or replaced in a few minutes without hoists or other machinery. They will save you a lot of time and some money.

THESE ADVANTAGES CUT COSTS

Platecoils take less room than pipe coils and increase the work load capacity of the tank. They save valuable floor space. Their rigid, continuous, relatively flat surfaces give more heat transfer to handle increased work loads. And this flat surface resists accumulation of deposits and is easier to clean than a jumble of old-fashioned pipe coils.

NOW AVAILABLE IN THESE METALS

Platecoils are available in Cold Rolled steel, Stainless steel, Carpenter 20, Monel, Hastelloy B, Hastelloy C, Ampco, and Nickel. Orders for Cold Rolled steel and Stainless steel get fast delivery from factory-tested stock.

PLATECOIL

DIVISION

TRANTER MANUFACTURING, inc.

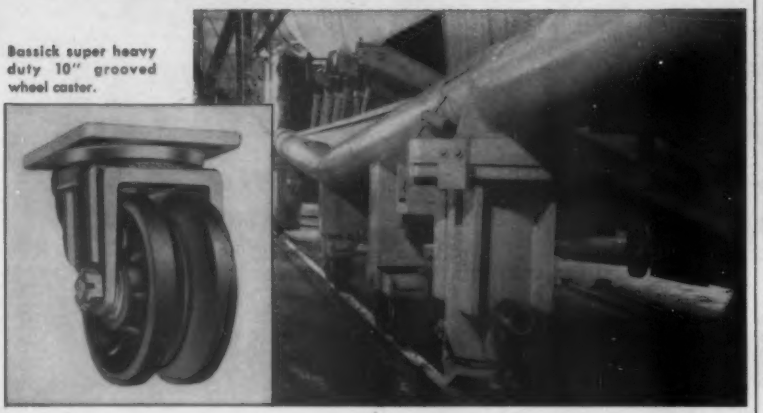
780 E. Hazel St., Lansing 4, Michigan

For more facts circle 511 on Reply Card

MATERIALS-HANDLING NEWS

★ Panel Discussions by Bassick, World's Largest Manufacturer of Casters and Floor Protection Equipment ★

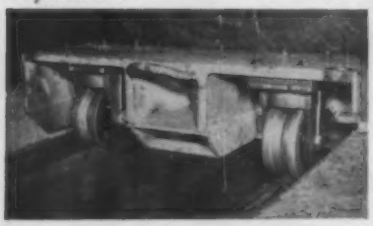
Industry gets mobility plus control with Bassick grooved wheel casters



Bassick super heavy duty 10" grooved wheel caster.

Aircraft industries put Bassick grooved wheel casters to work in every stage of production. Here, on a giant mating cradle, they carry the hull of an 80-ton Navy transport plane to mate with its nose and tail sections. Grooved wheels on inverted angle iron tracks provide the positive control needed.

Aircraft fire power also rides Bassick grooved wheels to the assembly point. Note here that they operate just as well off tracks as on. This gives you greater flexibility in designing your materials-handling system. The heaviest bombers (below), as well as parts, are handled by precision, super heavy duty Bassick grooved wheel casters with Timken axle bearings, indestructible horn, 1" heavy duty steel axles.

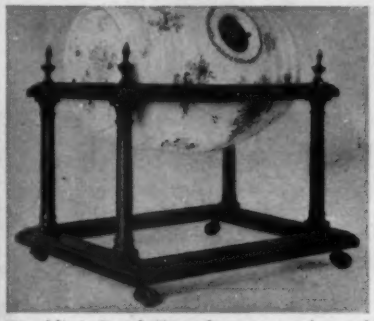


Other products on grooved wheels

Prefab house sections roll into place as still another industry finds use for Bassick grooved wheel casters. Providing positive control and easy mobility, they're production line favorites in the automotive, aircraft, manufacturing and many other industries.

Nike gets send-off as crew scrambles to prepare these ground-to-air missiles for firing test. Members of the Nike crew not shown, but important here are Bassick grooved wheel casters—also used on other guided missiles.

Ben Franklin's casters



Franklin's Punch Keg, the ornate piece of crockery above, was a gift he received in France about 1780. But the caster-equipped stand that holds it he built himself. If Ben had waited, we're sure that the Bassick Distributor in Philadelphia would have helped him pick the best casters for the job.

See your Bassick distributor . . .

Here are two of many ways he can help you: He's up on the latest developments in materials-handling with casters. And he'll keep needed units flowing—from his stockrooms—into your plant.

30% production costs reducible

Cost analysts report that materials-handling—which comes to about 30% of production costs—is the one cost area most capable of reduction. A good way for you to start paring costs is shown above. That production line of automobile axles moves safely and easily on Bassick Casters.

Sweet's

THE BASSICK COMPANY
Bridgeport 2, Conn.
In Canada: Belleville, Ont.

Bassick
A DIVISION OF
STEWART SW WARNER

MAKING MORE KINDS OF CASTERS . . . MAKING CASTERS DO MORE

For more facts circle 512 on Reply Card

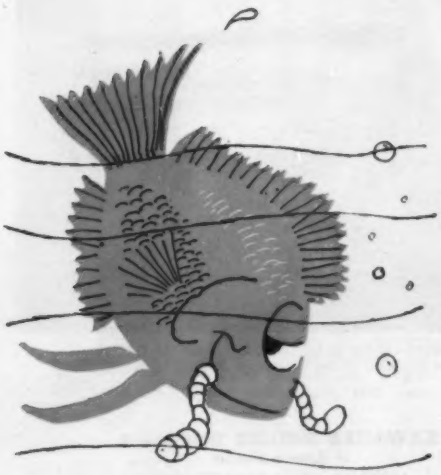
in fishing, all you can lose is the fish...

There's a lot of evidence to prove that we get just about what we pay for in this world, whether it's fishing tackle or lubricants.

When we sacrifice quality in the Isaac Walton department, the loss is usually limited to fish. But a compromise with quality in lubricants can be costly. It can result in excessive wear, down time, and needless maintenance expense. In any case, the costs of faulty lubrication are far greater than the small savings possible through the purchase of unsuitable lubricants.

When you think of quality lubricants, think of Gulf. The tough film, outstanding rust preventive properties, and excellent stability of Gulf lubricants are your assurance of efficient, continuous machinery performance. In fact, many plants have found that through the use of Gulf Quality Lubricants they have saved more than enough to pay the entire bill for oils and greases!

Remember too that Gulf provides the cooperative counsel of experienced engineers to help insure the proper application of the right lubricants for every unit of equipment and operating condition. Consult the telephone directory for the number of your local Gulf office and have a Gulf Sales Engineer call.



Gulf Oil Corporation · Gulf Refining Company

1822 Gulf Building, Pittsburgh 30, Pa.

GULF

THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS

For more facts circle 513 on Reply Card

HOW A JIGSAW HEATING PUZZLE WAS SOLVED

KEWANEE reserve plus rated boilers

MET SCHOOL HEATING NEEDS

A jigsaw puzzle heating problem . . . that's what it looked like at the Cranbrook School for Boys, Bloomfield Hills, Michigan, since the heating needs were so varied. But every puzzle piece fell into place when Kewanee Reserve Plus Rated Boilers were installed, because all heating needs were solved. Here's the way it worked:

Problem 1: Limited boiler room.

Solution: Two compact Kewanee Scotch Type Boilers with 50% reserve power guaranteed adequate heat under all conditions.

Problem 2: Fluctuating loads—boiler turned off nightly, turned on by stages in the morning.

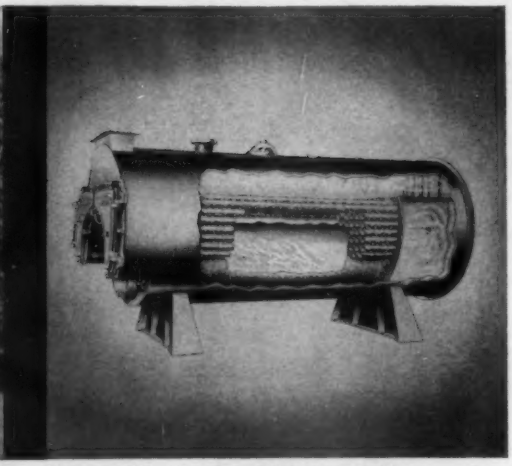
Solution: Kewanee Boilers had sufficient reserve to assure a fast, dry steam when needed to give quick heat.

Problem 3: Low operating—maintenance costs.

Solution: Since Kewanee Reserve Plus Rated Boilers certify 50% extra power built in, they operate at "cruising speed." Result—less fuel used, less wear on boiler, greater efficiency delivered.

Kewanee Reserve Plus means boilers are rated on nominal capacity, with adequate power to take care of present needs, emergencies and future expansion. Boilers rated on maximum capacity are inadequate for today's fast growing school needs. Next time select Kewanee Boilers.

Cranbrook School for Boys, Bloomfield Hills, Michigan
Heating Contractor: Laing Plumbing & Heating Company, Pontiac, Michigan
Engineer: Snyder & McLean, Detroit, Michigan



Kewanee LM-800 Series for 15 lbs. steam or 30 lbs. water installed in the Cranbrook School for Boys.

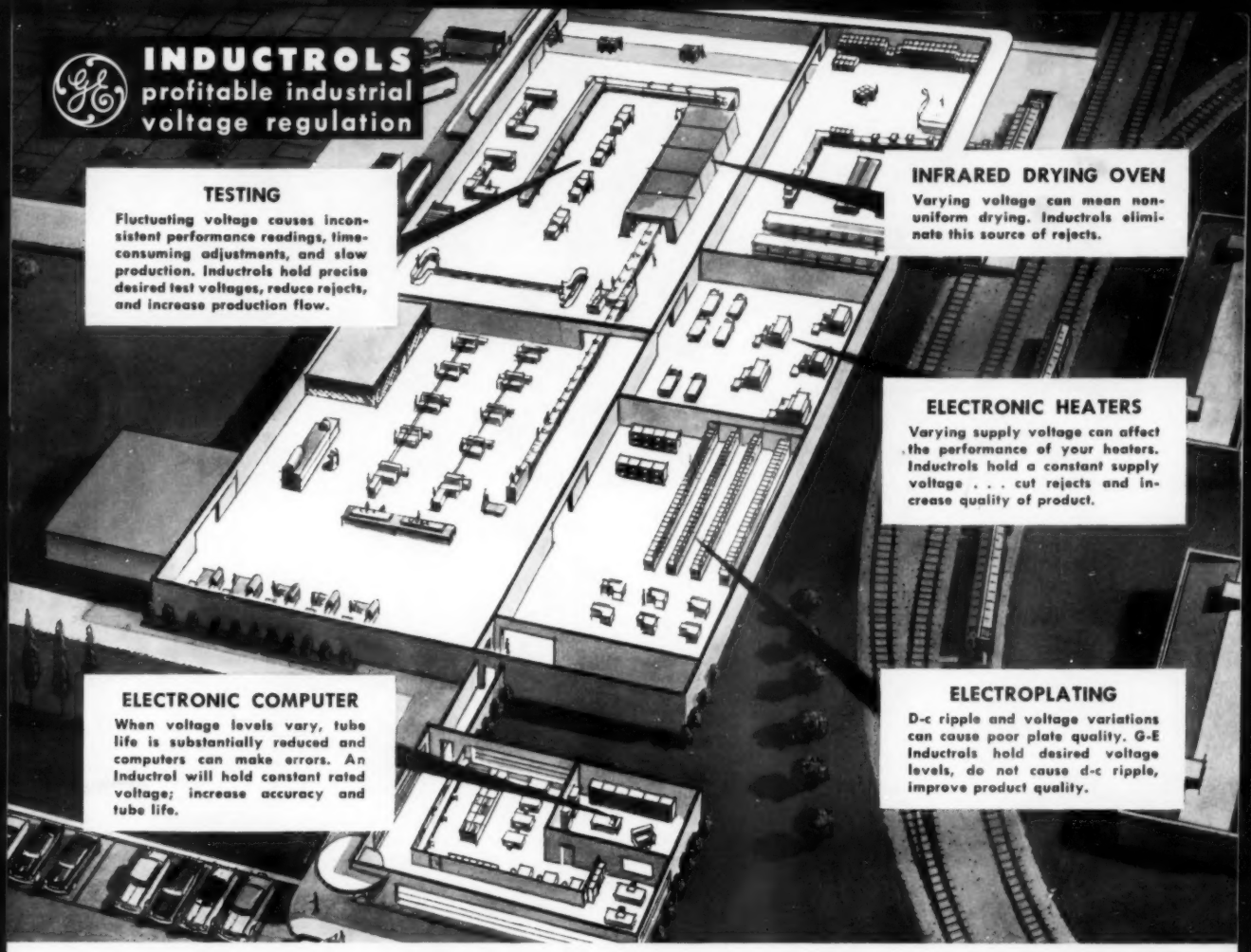
KEWANEE BOILER DIVISION
of American-Standard
101 FRANKLIN STREET, KEWANEE, ILLINOIS

KEWANEE BOILERS

You can depend on Kewanee engineering

For more facts circle 514 on Reply Card

INDUCTROLS
profitable industrial voltage regulation



TESTING

Fluctuating voltage causes inconsistent performance readings, time-consuming adjustments, and slow production. Inductrols hold precise desired test voltages, reduce rejects, and increase production flow.

INFRARED DRYING OVEN

Varying voltage can mean non-uniform drying. Inductrols eliminate this source of rejects.

ELECTRONIC HEATERS

Varying supply voltage can affect the performance of your heaters. Inductrols hold a constant supply voltage . . . cut rejects and increase quality of product.

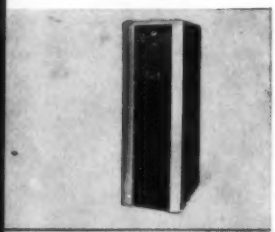
ELECTRONIC COMPUTER

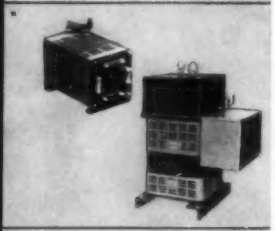
When voltage levels vary, tube life is substantially reduced and computers can make errors. An Inductrol will hold constant rated voltage; increase accuracy and tube life.

ELECTROPLATING

D-c ripple and voltage variations can cause poor plate quality. G-E Inductrols hold desired voltage levels, do not cause d-c ripple, improve product quality.

Cut production costs, improve product quality, with General Electric Inductrols





A G-E INDUCTROL FOR EVERY NEED

AUTOMATIC INDUCTROL

Automatically maintains voltage within ±1% band width on single- and three-phase circuits, 600 volts and below.

MOTOR- OR HAND-OPERATED INDUCTROL

Provides stepless variable-voltage output over any desired range. For process control, testing, heating, and similar applications. Single- and three-phase, 600 volts and below.

INDUCTROL POWER PACK

Actually an a-c load-center unit substation; includes a transformer, Inductrol, and distribution panel board with circuit breakers. Generally for three-phase circuits, 600 volts and below, indoor service.

Example shows how in-plant voltage regulation can save money, boost production, improve product, increase equipment life.

Any electrical equipment operates best at nameplate voltage. Even small deviations from rated voltage can reduce efficiency and shorten the life of your equipment.

G-E Inductrols (induction voltage regulators) offer an economical, profitable solution to your voltage problems. Inductrols have long, virtually maintenance-free life. There are no brushes to wear out or give trouble. High short-circuit strength assures reliable operation. The composite example above illustrates just a few ways you can save through the use of General Electric Inductrols.

For complete information and application assistance, contact your nearest General Electric Apparatus Sales Office, or write Section 425-1, General Electric Company, Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

For more facts circle 515 on Reply Card

For more facts circle 516 on reply Card ⟶

GENERAL ELECTRIC ANNOUNCES...
NEW Industrial
GENERAL ELECTRIC
DIRECT CURRENT MOTOR

Direct-current Motor

KINAMATIC* a new standard in direct-current motors, gives your machines wider speed ranges, greater output

To meet modern industrial needs for faster, more automatic, more continuous production, General Electric has designed an entirely new direct-current motor—the d-c Kinamatic.

Designed for Automation—Now, a direct-current motor has been designed for the modern job it has to do—either as individual motor drive or in regulating systems. The new General Electric d-c Kinamatic motor supplies the wide speed range and versatility required for today's manufacturing methods. It is designed for the close control of machines and split-second timing of processes essential to higher output.

Accelerated Production—The new d-c Kinamatic motor will modernize your equipment, give it increased power, higher speeds, greater output capacity. With the quick-acting G-E Kinamatic motor, your machines will process a greater variety of products . . . faster . . . easier . . . and with less maintenance and spoilage.

More Powerful—By combining advanced design with improved materials and manufacturing techniques, General Electric engineers have packed more power into the entire Kinamatic line. The powerful Kinamatic motor, with new stamina and durability, is ready to become one of your most effective weapons for keeping costs down, for meeting competition, for boosting productivity levels.

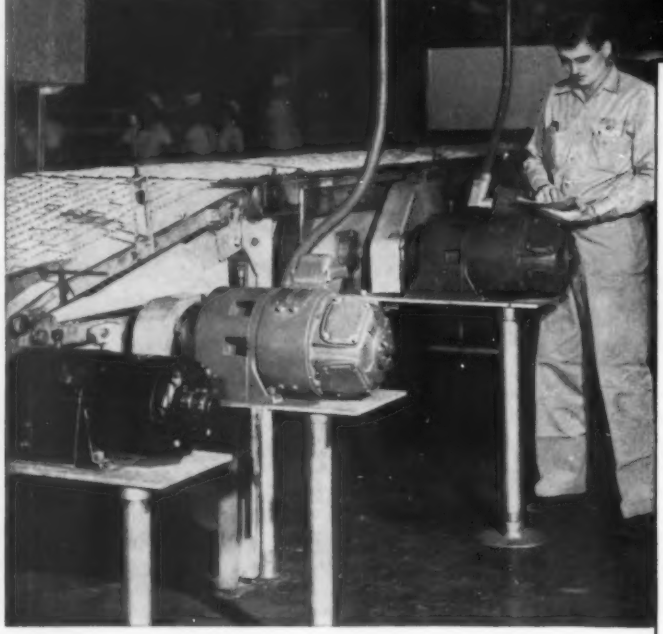
Engineering Help—Industrial specialists in 149 conveniently located General Electric Apparatus Sales Offices have the complete story on how the new d-c Kinamatic motors and generators can benefit your operation. For full details, contact your G-E Sales Representative, or write for Bulletin GEA-6355. *Direct Current Motor and Generator Department, General Electric Company, Erie, Pennsylvania.* 813-1

* Trade Mark of the General Electric Company

Progress Is Our Most Important Product

GENERAL ELECTRIC

Cut D-c Motor Downtime! Save Tube Replacement Costs!



Three important new features help make the GL-6807 motor-control thyratron dependable, long-lived:

BRAZED ANODE TERMINAL

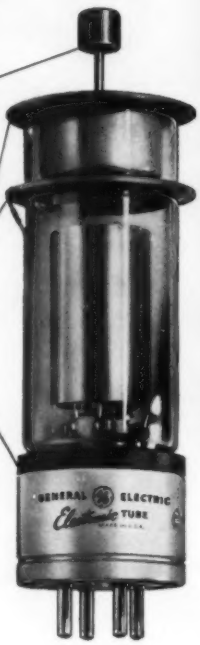
The terminal is brazed solidly to the anode lead—won't come off in service.

AIR-COOLED ANODE AND GRID

New tube construction lets outside air cool the anode and grid by direct thermal contact.

FIRM CATHODE BASE

A new, stronger cement—developed by General Electric and used here for the first time—assures a firm, lasting cathode base.



NEW G-E THYRATRON IS INDUSTRY-DESIGNED!

GL-6807 outperforms, outlasts earlier control types!

Replaces Type 5545—at 16% less tube cost! Brand-new construction gives improved cooling, far greater ruggedness!

General Electric's new Industry-Designed GL-6807 brings you more hours of reliable d-c motor control than any previous thyratron. With the GL-6807 you benefit from tube improvements specifically aimed to cure maintenance headaches . . . cut tube replacement costs.

New-design cooling of anode and grid. Gives you a far more dependable tube than ever before—one that is virtually proof against overheating.

New-design brazed anode terminal. Connection is stronger. The terminal won't break or pull off when tube is installed or replaced.

New-design cathode base. A firmer base for the cathode prevents loosening in service.

The new G-E tube replaces Type 5545 . . . you can use it in a high percentage of your motor-control sockets. Price is 16% lower than the 5545, yet ratings are the same: 6.4 amp avg current—1500 v peak voltage— −55 to +70 C ambient temperature range.

Keep your d-c motors operating full-time, avoid plant production delays, save tube costs . . . with General Electric's brand-new GL-6807 thyratron! It's *Industry-Designed* for long life and economy! Your G-E tube distributor will be glad to give you further information. *Tube Department, General Electric Co., Schenectady 5, N. Y.*

Progress Is Our Most Important Product

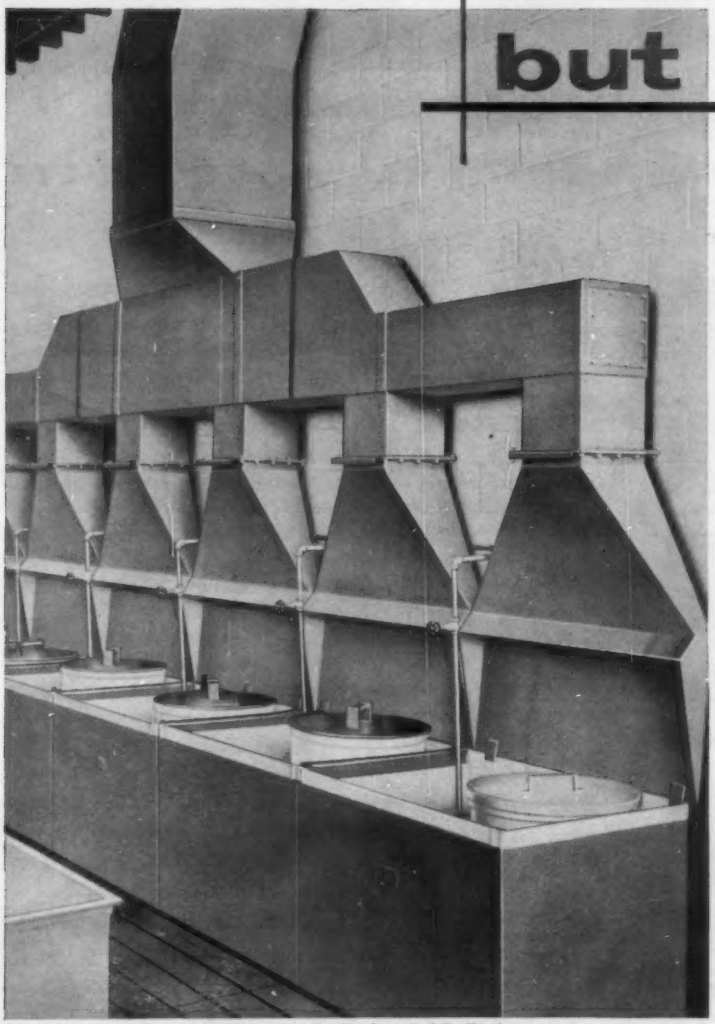
GENERAL ELECTRIC

161-1C2

For more facts circle 517 on Reply Card

INDUSTRY'S MOST SHOCKING WASTE...

CORROSION COSTS EQUAL 25% OF NET PROFITS!



but

COMCO, INC.

put an end to corrosion with EXON-based PVC!

NEW HAVEN, CONN. Venting 13,000 cubic feet of corrosive fumes per minute cost a pocketbook-frame manufacturer heavily in maintenance painting and frequent replacements. Called in to stop corrosion, Comco, Inc., New Haven, lined the tanks with VYFLEX L-10*, a tough PVC 3/32" thick; fabricated rigid PVC flues 20' long of VYFLEX F-92* ... and wiped out his corrosion cost for good. Both lining and flues were made of materials based on Firestone Exon resins.

You can stop corrosion!

EXON PVC resins are the bases for a wide variety of lightweight structural rigids, linings or coatings, pipes and fittings ... engineered specifically to wipe out your particular corrosion problem. To stop Industry's most shocking waste, call:

Firestone

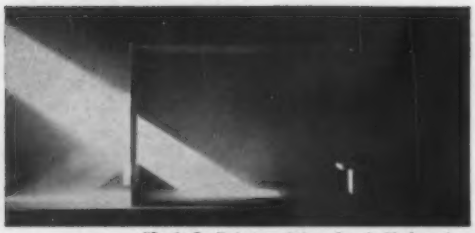
EXON

CHEMICAL SALES DIVISION
FIRESTONE PLASTICS CO., Dept. 615F, Pottstown, Pa.
A Division of the Firestone Tire and Rubber Company

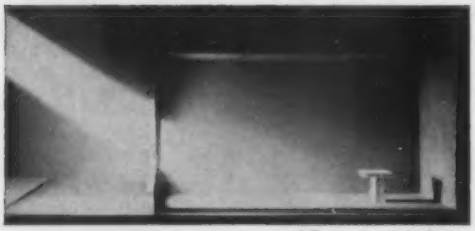
*Products of Kaykor Industries, Inc., Division of Kay-Tex Mfg. Corp., Yardville, New Jersey

For more facts circle 518 on Reply Card

THERE'S MORE TO *daylight* THAN MEETS THE EYE



"Smoke Box" photo—window glazed with clear glass.



Diffusing glass in smoke box.

Directional diffusing glass in smoke box.

Stop Glare and Heat with Light Diffusing Glass

Like other natural resources daylight needs to be controlled to be of greatest benefit. "Raw" daylight seldom meets specific lighting needs, since it contains a host of unwanted factors that cause discomfort and inefficiency. Obtain the results you want by specifying a glass "visioneered" to meet your requirements.

Good daylighting can be achieved with a handsome, modern, diffusing pattern which disperses softened light deep into interiors, provides comfortable, even illumination without harsh glare and sharp contrasts that cause costly eye fatigue. And if excess heat is a problem, keep interiors more comfortable with Mississippi Coolite, heat absorbing, glare reducing glass, which absorbs up to 50% of solar heat rays.

In your new building or remodeling projects gain all the benefits of natural light without the drawbacks. Control "raw" daylight by specifying Mississippi Glass. Available everywhere in a wide variety of patterns and surface finishes, wired and unwired, all "visioneered" to solve your daylighting problems.

Write today for free catalog No. 56G • Address Department 13.

MISSISSIPPI GLASS COMPANY

88 Angelica St. • St. Louis 7, Mo.

NEW YORK • CHICAGO • FULLERTON, CALIFORNIA

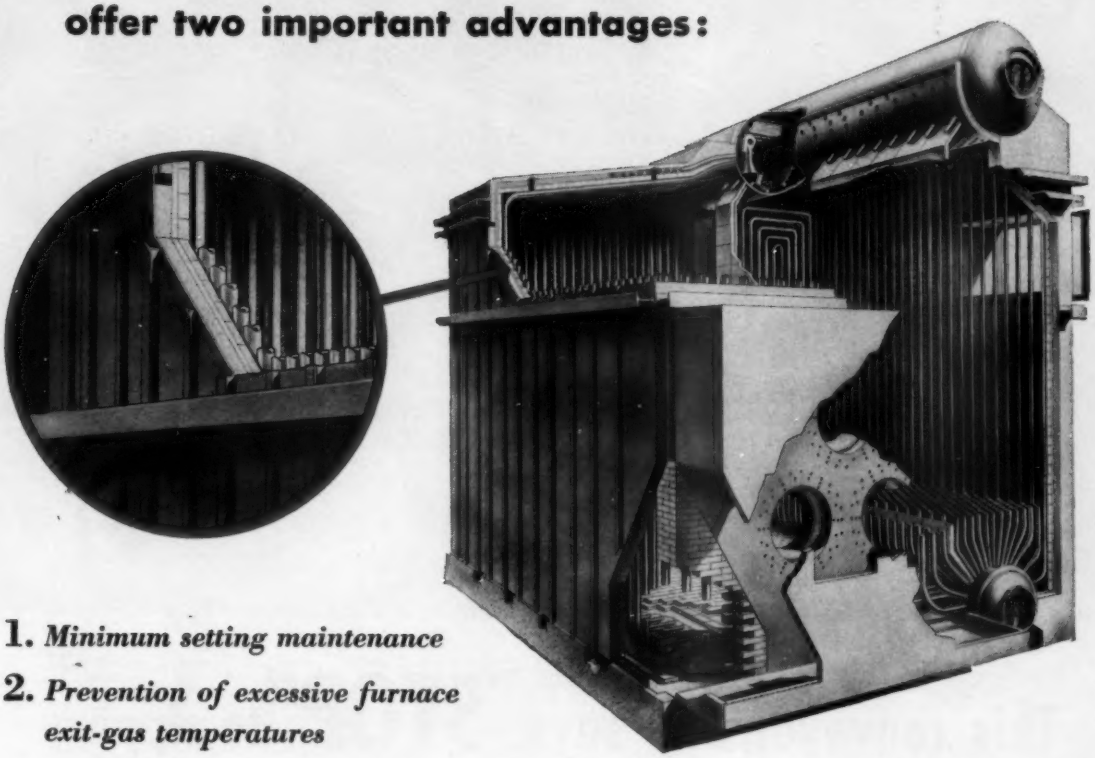
WORLD'S LARGEST MANUFACTURER OF ROLLED, FIGURED AND WIRED GLASS

For more facts circle 519 on Reply Card

Another Feature of the FW Series "SC" Standard Boiler...

COMPLETELY WATER-COOLED WALLS

offer two important advantages:



1. *Minimum setting maintenance*
2. *Prevention of excessive furnace exit-gas temperatures*

All furnace walls of this Series "SC" Steam Generator are water-cooled by closely-spaced 3" OD tubes. As a result, setting maintenance is minimized and excessive furnace exit-gas temperatures prevented. The tubes are backed by first-quality refractory, heavy-duty insulation and fully-stayed steel casing.

This is another advanced-design feature of the Foster Wheeler Series "SC" Steam Generator that has been developed primarily for reducing power and process steam costs in industrial plants.

Series "SC" employs a standardized design. Dimensions and structural details are fixed. Yet the design provides a wide choice of working temperatures and pressures, balanced draft or pressurized firing, type and location of heat recovery equipment, type and location of fans and drives, oil or gas firing. This means that the "SC" boiler and its auxiliary equipment can be properly integrated to meet your individual plant needs.

FW Series "SC" Steam Generators are available for oil or gas firing, in capacities from 50,000 to 150,000 lb./hr., for pressures to 1500 psi and superheated steam temperatures to 950 F.

For further information, write *Foster Wheeler Corporation, 165 Broadway, New York 6, N. Y.*

OTHER FEATURES AT A GLANCE

- Over 19-foot firing depth
- Unrestricted circulation
- All-welded casing
- Fully drainable superheater
- Efficient convection surface
- Bottom supported unit
- Steam purifying system
- Full insulation

FOSTER WHEELER

NEW YORK • LONDON • PARIS • ST. CATHARINES, ONT.

For more facts circle 520 on Reply Card

This conveyor belt says "STOP" to ripping

How often has your plant had to junk an almost new conveyor belt . . . ripped to shreds by razor-sharp particles which embed themselves in the belt, then jam and slit long sections?

NYB&P's new RESISTORIP* construction is designed to put a stop to such needless waste! This construction, for which a patent is pending, can be incorporated in any of the better grades of NYB&P conveyor belting.

Essentially, it consists of groups of high-tensile steel wires built transversely into the belt's carcass at close intervals throughout its length. When a sharp, partly-embedded object starts to rip this belt, it quickly encounters one of these wire groups. Immediately it is ejected . . . and damage to the belt is confined to a very short section, only inches in length! This RESISTORIP construction, however, does not adversely affect troughing characteristics.

Designed by NYB&P belting specialists to withstand even the hazards of foundry shake-out service, and field-tested for more than five years, RESISTORIP Conveyor Belting has amply demonstrated its ability to double or treble the life of belts carrying sharp-edged materials likely to cause ripping.

Only your NYB&P distributor can supply you with belting of RESISTORIP Construction. You will find him listed in the yellow pages of your phone book or write to address below.

*Trade Mark

Gilmer V-BELTS AND "TIMING®" BELTS

NYB&P INDUSTRIAL RUBBER PRODUCTS

NYB&P — NEW YORK BELTING & PACKING CO. 1 Market St., Passaic, N. J.

America's Oldest Manufacturer of Industrial Rubber Products

For more facts circle 521 on Reply Card

BULLETINS just released and of immediate plant interest

MATERIALS HANDLING

101 Controlled Flow—Complete information on Rapistan controlled flow conveyor systems is provided in this brochure. A series of questions and answers on controlled flow covers efficiency, economy and other advantages of this combination of standardized conveyors linked together to form a basic flow system. Also provided is a controlled flow check list and field reports covering installations in a wide range of industries. Data on conveyor accessories included. The Rapids-Standard Co., Inc.

102 Lift Truck Developments — To keep plant engineers posted on new developments in materials handling equipment, these three brochures cover company's entire line of fork lift trucks, tractors and accessories. In addition to showing what's new, one folder gives standard specifications on all models now in production. Other folders outline important phases of engineering research and development related to accessories. One of these covers standard accessories; the other illustrates and describes typical examples of custom-engineered accessories and equipment designed for specialized handling. Towmotor Corp.

103 Overhead Handling — Bulletin M-31, 6-pp, tells how Trambeam overhead handling systems are used in one plant to keep things moving from receiving, through production, to storage and shipping. Operation advantages are pointed out and installation photos are included. Whiting Corp.

104 Heavy-Duty Fork Trucks — Electric fork trucks with 7000-, 8000- and 10,000-lb capacities are described in 6-pp Bulletin 1328-A. Presents company's Type JON trucks, designed for ease of handling and maintenance. Gives full details on the truck and its components, tabulates dimensions and specifications, and describes and pictures many attachments. The Baker-Raulang Co.

105 Drum Handling Equipment—Bulletin 201 presents company's drum and barrel handling equipment. Drum turners, slings, chime tong, chime tong spreader, vertical grab and drum lifter are shown and described as to application. Other equipment covered includes hooks, belts, drum and tank spreader. Downs Crane & Hoist Co.

106 Inter-Floor Transportation — Construction features and applications of company's manlift for fast inter-floor transportation are described in Bulletin 07B6878B. Includes diagrams showing safety measures to be considered with each installation. This manlift is also designed to carry bags and other packed materials. Allis-Chalmers Mfg. Co.

107 Car Pullers—Bulletin L-6, 10-pp, illustrates and describes company's line of car pullers. Shows capstan type car pullers for moving cars a short distance using manila rope. Three style of drum car pullers for heavy duty car moving, shuttle work or for servicing exceptionally large areas are also listed. Clyde Iron Works, Inc.

PUMPS, COMPRESSORS

108 Condensate, Vacuum Pumps—Bulletin 1465, 28-pp, describes company's Type S condensate pump and the complete line of vacuum and condensate pumps. Large cut away illustrations, pump selection guide and installation diagrams are included. Engineering data are tabulated and suggested specifications given. Sarco Co., Inc.

109 Fire Pump—Bulletin B-1500, 36-pp, describes and illustrates a line of horizontal centrifugal fire pumps, with selection charts and a set of typical fire pump specifications included. Pumps are listed into groups according to types of drive. Also included are descriptions of standard single stage and multi-stage pumps, as well as typical installation arrangements. Fire pump fittings, tank filling and jockey pumps are shown. Peerless Pump Div., Food Machinery and Chemical Corp.

110 High Pressure Pumps—Application of company's horizontal Triplex pump in 10 different industries is covered in Builetin P-55, along with the construction and operation of the mechanism. Shows five basic cylinder designs meeting requirements of a wide range of pumping applications. A specification chart is included, also graphs covering machine selection and typical power curves. Manton-Gaulin Mfg. Co., Inc.

111 Centrifugal Pumps—Bulletin 1030 illustrates and describes Series S Chempumps, latest addition to company's line of seal-less centrifugal pumps. Performance curves and dimension drawings are included along with a discussion of operating principles and list of specifications. Chempump Corp.

112 Centrifugal Pumps—Circular 190, 6 pp, describes standard centrifugal pumps for general and chemical service. Design features are discussed, materials of construction are listed; and simplicity of design and parts interchangeability are explained and illustrated. Also includes specifications. Dean Brothers Pumps, Inc.

113 For the Process Industries—Air and gas compressors used in process and chemical industries are shown in 8-pp Form 3132-A. Shows centrifugal and reciprocating units, with electric, steam, gas and diesel power, for pressures from deep vacuum to 35,000 psi and capacities to 165,000 cfm. Compressors are pictured in operation on such varied jobs as refining, drug manufacture, chemical production. They handle chlorine gas, hydrogen, ammonia, hydrogen chloride, other gases and air. Shows 15 basic types. Ingersoll-Rand Co.

MAINTENANCE

114 On Rust Prevention—This 1956 General Catalog, 28-pp Form 255, presents a treatise on rust prevention with illustrations of Rust-Oleum uses and applications throughout industry. Included are 102 color chips showing variety of colors available in primers, short oil type coatings, oil field finishes, restful color group finishes, machinery and implement colors, long oil type coatings, calvinoleum coatings, heat resistant coatings, chemical resistant coatings, and floor and deck coatings. Rust-Oleum Corp.

115 Portable Vacuum Cleaners—Performance information and specifications on portable vacuum cleaners are contained in this bulletin. Models described range in power from ½ through 1 hp and can be used for dry or wet pick-up. They use company's standard tools and attachments, more than 20 of which are shown. The Spencer Turbine Co.

116 Metal Protective Paints — This 8-pp catalog describes advantages and technical features of company's anti-corrosive paints for the protection of metal surfaces. A selection guide is included, along with application information. Subox, Inc.

117 Solvent Detergents—Cleaning uses and abilities of solvent detergents—solvents compounded with surface active agents—are described in this 16-pp booklet. Tells how solvent detergents, used without heat, remove carbonized grease and oil and certain types of paint, and provide temporary rust protection after cleaning. Methods of application are described, including procedures and solution concentration. Application equipment is illustrated and discussed. Oakite Products, Inc.

118 Floor-Maintenance — This illustrated folder describes products designed to aid efficient floor care. Lists combination scrubber-vacuum machines, conventional scrubbing-polishing machines, steelwool pads, applicators, vacuum cleaners, mop trucks, and other equipment. Also lists waxes, sealers, and cleansers. Finnell System, Inc.

119 How Do They Sweep?—Bulletin Board Edition 6 of Modern Sanitation Methods shows proper work methods for sweeping stairways. Presented in form of an illustrated poster to serve as a training aid for sanitary maintenance crews, covers methods for wide and narrow stairs. National Sanitary Supply Ass'n.

WATER TREATMENT AND WASTE HANDLING

120 Water Conditioners—This bulletin file describes a device designed to eliminate and prevent corrosion and scale formation in boilers and water systems. Explains how it works and gives advantages. Applications are discussed and specifications included. Packard Water Conditioner Div., Inc.

121 On Alkalinity Reduction—Technical Reprint T-142 discusses the details of dealkilization, a method of alkalinity reduction. This process is also known as sodium zeolite-anion exchange and offers advantage of not requiring corrosion resistant equipment. This article discusses the details of the process and where it can be used. Actual chemical equations show how the reaction takes place. Graver Water Conditioning Co.

122 Waste Treatment Systems — Technical Paper 64, 6-pp, presents a solution to water and waste treatment problems, describing several practical systems for process and waste treatment utilizing controlled volume pumps to meter chemicals and additives. In the area of water treatment, coagulation, clarification, boiler water treating and oxygen scavenging by hydrazine addition are discussed in detail. Paper mill white water recovery systems and waste treatment systems in plating mills, aircraft plants and metal fabricating plants, are also analyzed. Milton Roy Co.

123 Industrial Waste Treatment—Technical Reprint T-145, 6-pp, discusses the subject of specifying industrial waste treatment. Proper steps to be taken in approaching the problem, methods of treatment and types of equipment used to accomplish given tasks are covered. Graver Water Conditioning Co.

PIPING, VALVES, FITTINGS

124 Plastic Pipe—Technical Bulletin 80-3, 8 pp, gives information on Ryertex-Omicron PVC rigid type unplasticized pipe. Provides properties and engineering data on this polyvinyl chloride pipe and lists over 200 chemicals it will convey without being attacked. Joseph T. Ryerson & Son, Inc.

125 PVC Pipe Fittings, Flanges—This is a comprehensive 12-pp catalog on corrosion resistant pipe fittings and flanges in normal- and high-impact grades, rigid, unplasticized polyvinyl chloride. Shows characteristics, advantages and limitations. Lists operating pressures, temperatures, applications, price comparisons, fabrication advice, installation and supporting recommendations, dimensions and weights. Grinnell Co., Inc.

You'll save time in ordering Bulletins by using the Reader Service Cards provided on pages 225-226. Of course, we honor letterhead request—but it takes us a bit longer to handle them.

126 Expansion Joints—Catalog 153, 24-pp, a complete design guide for application and selection of expansion joints, is filled with engineering application and selection data necessary to the proper solution of pipeline expansion problems. Includes a discussion of types of expansion joints available and types of pipeline motion solved by expansion joints. Includes a schematic piping layout illustrating expansion joint applications and principles, as well as full specifications. Flexonics Corp.

127 Data on Expansion Joints—Catalog 53, 24-pp, features comprehensive engineering data on HydroLastic expansion joints. Details of construction and specifications together with directions for ordering and application data for various piping systems are included. Information is presented in the form of tables

BULLETINS

(Begins on page 25)

and numerous photos and drawings are used to illustrate various types of expansion joints. Cook Electric Co.

128 Pipe Strainers—Bulletin 602 gives complete details on company's line of Y-type pipe strainers. Covers design features, dimensions and prices of the eight sizes of cast semi-steel strainers for pressures to 250 lb and the six sizes of carbon moly steel strainers for pressures to 900 lb., temperatures to 900 F. Armstrong Machine Works.

129 Air Control Valves—This bulletin is designed as a quick-reference guide to 17 different lines of air-control valves and accessories. Describes each type and includes size and capacity data, along with photos of the valves. Airmatic Valve, Inc.

INSTRUMENTS, CONTROLS

131 Heating Controls—Condensed Heating Catalog, Spring 1956, is a 52-pp ordering book on automatic heating controls. Many new items, including a line of oil, coal and electric controls, plus recent improvements and changes in company's gas heating controls are covered. Indexed by product classification and model numbers, book presents ignition systems, fan and limit controls, humidity controls, low water cutoffs, meters, burner controls, regulators, thermostats, valves, many others. General Controls.

132 Electric Thermostats—Revised Bulletin 1000B describes electric room thermostats for industrial plants and institutions. Also featured are immersion thermostats for hot water heating systems, unit heaters and alarm circuits, and surface thermostats for low limit control on unit heaters. Sarco Co., Inc.

133 Temperature Controllers—Bulletin 1025B describes company's LSI electric indicating temperature controller. A simplified operational sketch shows how unit can be used to provide sequence control combinations such as: step-heating, heating and cooling, wide differential control, holding and operating temperatures, and also temperature control plus operation of signal devices. Sarco Co., Inc.

134 Heating Controls—Bulletin NR-26 describes use of automatic time controls with oil burners, gas units and stoker. Standard timer applications are listed together with type of time control required for each. A brief description of switch action on temperature control is given for each application. A section devoted to wiring diagrams accompanies the suggested uses. Control of various types of thermostats, singly and in combination, is illustrated. International Register Co.

135 Resistance Temperature Detectors — In 8-pp Publication 3016D are described a line of remote temperature-sensitive elements for use with indicating, recording, controlling and monitoring equipment. Operation, application and construction details of the resistance temperature detectors are presented, along with specifications and ordering information. Instrument Div., Thomas A. Edison, Inc.

136 Ultrasonics for Industry—Comprehensive 8-pp Bulletin 50-105 covers application of the Ultrasonic Reflectoscope for non-destructive testing of products and equipment. Illustrates its many uses and explains in simplified terms the principle of ultrasonic inspection as well as illustrating latest types of equipment. Sperry Products, Inc.

137 For Direct Radiation—Bulletin CA-12, written in non-technical language, tells how to determine proper control system for direct radiation. Illustrated with charts and graphs, this bulletin includes control of steam and hot water and discusses both two-positioning and proportioning modes of control. Barber-Colman Co.

139 Troubleshooting Tool — This bulletin covers operation and application of a troubleshooting tool and portable balancer. Tells how this equipment is used to remove guesswork in locating and correcting cause of mechanical troubles in machine tools and rotating machinery. Instrument described, the Model 1064 variable filter, is used in combination with company's vibration analyzers to spot chatter, bearing failures, mechanical troubles, etc. International Research & Development Corp.

140 Oxygen Analyzer—Sixteen-pp Catalog 55-829-56 explains principle, construction, operation and features of both the paramagnetic type Magno-Therm analyzer and the electronic recorder. A chart of major applications lists functions, examples of services, and how and why this analyzer is used. Special models are also described and illustrated. The Hays Corp.

CONSTRUCTION

142 Portable Buildings — This broadside shows nine variations of the standard USF Handy-Hut—a portable all-steel building. Also illustrates company's clip-and-wedge method of erection without screws or bolts; tells how to adapt and build to your requirements from a basic design by adding length in 2-ft multiples and choosing various side panels and accessories. United States Steel Fabricators, Inc.

143 Concrete Gunning—This 16-pp catalog not only gives full details, specifications and operating capacities of concrete gunning equipment, but also contains answers to often-asked questions about air placed or gunned concrete. Also included are actual job application photos showing varied uses of this equipment. Booklet describes Airplaco portable concrete gunning rig—a combination of equipment which forms a unit consisting of equipment needed for practically any concrete construction, maintenance or restoration job. Air Placement Equipment Co.

144 Aluminum Building Projects—Form AD 285 is a 32-pp 1956 catalog covering company's line of aluminum industrial building products. Cites advantages of aluminum, pictures some installations. Installation data, weights, dimensions and roughing-in details are provided on corrugated roofing and siding, V-beam roofing and siding, ribbed siding sheet, perforated corrugated sheet, flat flashing sheet. A discussion on sandwich wall system is presented. Accessories and fasteners are also covered, and suggested specifications included. Aluminum Co. of America.

145 Precast Concrete Slabs—Detail drawings and design data on a precast concrete floor and roof system are provided in this 8-pp booklet. It illustrates structural, finish, electrical, heating and plumbing details. Simplified erections, job savings and specifications are explained also, along with pictures of typical installations. The Flexicore Co., Inc.

146 Steel-Mesh Flooring—Protection of severely abused industrial floors and floor areas is described in this 20-pp illustrated catalog. Points out advantages of Gridsteel, a low-cost steel-mesh floor armor, and details installation procedure. Also gives specifications and includes photos and drawings of installations. Irving Subway Grating Co., Inc.

147 Curved Lens Panel—Bulletin L-110-B gives complete information on company's low brightness curved lens panel. Included are brightness data, coefficients of utilization, formulas for calculating illumination levels and suggested specifications for application. Corning Glass Works.

148 Stainless Fasteners—This 52-pp book is a comprehensive guide to company's line of stainless fasteners. Thumb-indexed for easy reference, it is divided into two sections: stock list and specifications of basic fastening devices, and engineering tabular data. Specifications relating to head, shank, and thread dimensions of forty basic fastening devices including bolts, screws, nuts, washers, rivets, pipe fittings are included. Engineering data relating to composition, properties, applications, and weights of stainless steels are given. Allmetal Screw Products Co., Inc.

149 Improved Fasteners—Bulletin TL-107 details use of Tuf-Tite fasteners for roofing and siding materials. Gives details on how these fasteners with their assembled Neoprene washers form a watertight seal when applying aluminum, galvanized or stainless steel, protected metal, fiberglass, plastic and insulated panels. Recommendations for proper location of the fasteners, torque settings, screw guns and drill sizes are included, as well as a table of specifications, materials, sizes and ordering information. Townsend Co.

Reader Service Cards for ordering bulletins are on pages 225-226. Be sure to include your name, job title, and company.

150 Top Side Fasteners—Described in this folder are DS bolts for easy, economical and weatherproof bolting of corrugated roofing and siding. Pictures three simple steps involved in installation and lists advantages of these fasteners. Includes dimensional drawings of the bolt, also photos of an installation. Delbert L. Smith Co., Inc.

TOOLS, WELDING, AND MACHINE SHOP EQUIPMENT

151 Hand Tools—Nine new hand tools for sheet metalworking are introduced in 12-pp Bulletin 78-B: three compound leverage shears (for straight, right and left cuts), three straight snips and three combination snips. Also described and illustrated are bench shears, hammers, mallets, stakes, bench plates, rivet sets, groovers, hollow punches, bending machine, roofing folder, pipe crimper, roofing double seamer and gutter beader. Niagara Machine & Tool Works.

152 Portable Air Tools—Bulletin 53, 8 pp, illustrates and gives specifications for assembly tools; drills; small wheel grinders; straight grinders, vertical grinders, and scalers, chippers and rammers. Sizes, weights and capacity data are provided. The Rotor Tool Co.

153 Buffing, Grinding Chart—This handy 3-by-5 in. disk chart is for determining surface speed of buffing and grinding wheels. Helps you to find quickly the surface speed, in feet per minute, of any wheel from 1- to 60-in. diam, turning at spindle speeds from 220 to 20,000 rpm. Hanson-Van Winkle-Munning Co.

154 Repairing Cast Iron Parts—Illustrated bulletin outlines information on the welding of cast iron with Ni-Rod and Ni-Rod 55. Nine graphic case histories show welding electrodes in action. The International Nickel Co. Inc.

155 Cemented Carbide Tools—Most effective cutting speeds for carbide tools, machine tool horsepower requirements, how to determine shank size of single-point tools, carbide tool geometrics, carbide grade selection and other technical topics are covered in 66-pp Catalog GT-310. Besides information on the machinability computer, bulletin also includes price and specification data on standard brazed carbide tools, tool holders, standard carbide throw away inserts, blanks for twist drills, dies, bushings, guide rings, balls, and valve seats. Carboloy Dept., General Electric Co.

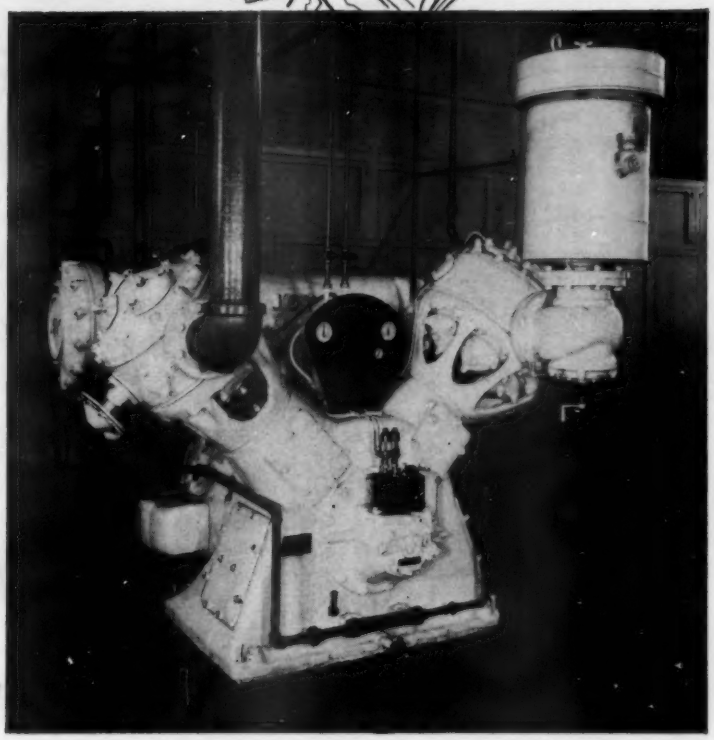
156 Vibration Mountings — Rubber-in-shear vibration mountings are described in Catalog RS-55. Covers such construction features as "floating action" that provides flexibility and isolation. Various types of vibration on mountings with load capacities from 40 to 10,000 lb are described as are non-walking base-plates. T. R. Finn & Co.

157 Comparator Gages — Bulletin 200 describes and illustrates electric comparators for all purpose external measurements from gage blocks to production parts and offering four measuring ranges in one gage. Three models are detailed, and benefits of all-purpose features are explained. Ten typical applications are shown. Metron Instrument Co.

COOLING AND HEAT EXCHANGING

159 Centrifugal Refrigeration — Bulletin DS-399, 52 pp, gives complete data on company's CenTraVac centrifugal refrigeration equipment, used to provide chilled water for air conditioning and refrigeration systems. Provides full engineering and capacity information on 20 sizes, including six models in the 400 to 600 hp range, and eight models in the 50 to 300 hp range. Typical installations are shown, as are numerous cut-away views and pictures of component parts. The Trane Co.

(More Bulletins on page 227)



The Boss asked:

"WHAT'S SPOILING OUR SKILLED MECHANICS?"

. . . so I told him about our JOY WN-112 compressor

"To begin with, the heavy-duty Joy WN-112 supplies dependable industrial air power—up to 125 psi with piston displacement from 368 to 974 CFM. It is a compact two-stage, double-acting, water-cooled compressor—efficient in operation, and vibrationless—reducing wear and tear.

"And this compressor is *easy* to maintain. It has no large, heavy parts that need adjusting. Cylinder liners and cross-head guides are not an integral part of the frame. They can easily be replaced in a short time. Yes, that WN-112 is a breeze to maintain . . . and *that's* what is spoiling our skilled mechanics."

The WN-112 has two separate, protected, force-feed lubricating systems; one servicing the running gear, the other for the cylinders. Even the cross-head face is force-feed lubricated.

Joy "Dual-Cushion" valves have greatly prolonged life because of the variable reaction cushion which eliminates all pounding valve action. Truncated pistons, of strongly reinforced alloy, permit locating of valves on an angle. This insures smooth air flow and efficient head cooling.

All flange-mounted motors for Joy compressors are built to Joy specification. Floor space and foundation requirements, already minimized by the compressor's package design, are 50% less with the flange-mounted motor. The WN-112 is adaptable to other drives if desired.

For complete details, write ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Write for Bulletin 37-15

Consult a Joy Engineer

For Air and Gas Compressors, Oxygen and Nitrogen Generators, Vacuum Pumps and Boosters, Conveyors, Fans, Electrical Connectors, Hydraulic Fittings and Hose Assemblies.

WBW 18609-37

JOY

SPECIALISTS IN THE COMPRESSION AND MOVEMENT OF AIR AND GASES SINCE 1885

For more facts circle 522 on Reply Card

DUST DISAPPEARS LIKE MAGIC!

A little air (50 cfm), proper hooding and the right ROTO-CLONE Dust Collector can do the trick—ECONOMICALLY

NOW YOU SEE IT!

Grinding operation before dust control.

NOW YOU DON'T!

Grinding operation after dust control.

Are you conveying, screening, grinding (as above), weighing or packing dry materials? Then the picture at the left may be familiar. Dust "dogs your footsteps" everywhere!

Now, look at the scene at right. Everything clean and serene! Good exhaust hood-design reduced needed air volume to a minimum—50 cfm—making it inexpensive and practical to apply efficient dust control. Resulting benefits? You know them well—

AAF's more than 20 years' experience covers the entire range of industrial dust control problems—has resulted in today's complete line of ROTO-CLONE* Dust Collectors. Whether your dust problem involves a single machine, a complete department or an entire plant operation, this experience can point the way to "short cuts", economies—and results. For complete information, call your local AAF representative or write us direct.

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American Air Filter

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228 Central Avenue, Louisville 8, Kentucky

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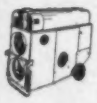
BETTER AIR IS OUR BUSINESS

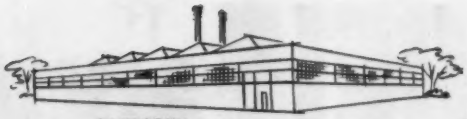
Herman Nelson Unit Heaters



Herman Nelson Portable Heaters

For more facts circle 523 on Reply Card

APARTMENTS



FACTORIES

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SCHOOLS

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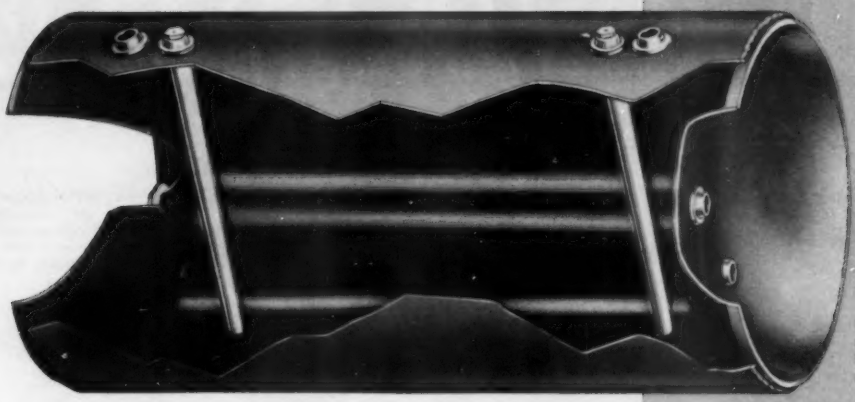

Cut-a-way view of concave type tank suitable for horizontal or vertical mounting.

● Here is an outstanding line of glass-lined, large volume water storage tanks to meet your demands for the clean, rust-free storage of cold and hot water for your industrial needs. Where rust and corrosion are annoying problems and where long tank life is desired, these new glass-lined water tanks are the answer . . . and at reasonable cost.

The inside of these new tanks are completely coated with special A. O. Smith ceramic glass, permanently fused to the steel. Stored water will stay as pure and clean as your water supply, and rust free, too, because the mirror-smooth, glass-surfaced steel tank can't rust or corrode under any water conditions. Magnesium rods provide added protection against corrosive action. Hot water at any normally encountered high temperature may be stored.

Ranging in size from 80 to 6000 gallons, designed for horizontal or vertical mounting in the smaller sizes . . . available for use in direct-fired hot water systems, or fitted with coils for steam systems . . . especially adaptable to the A. O. Smith *Burkay* industrial water heating systems . . . you have a proved line of water storage tanks to choose from. Warranted for 5 years. See your nearest A. O. Smith distributor for full details.

ASME Seal available on request on special order except 80-gallon size.

Permaglas®

LARGE VOLUME WATER STORAGE TANK

for restaurants, plants, motels, laundries, apartments, homes, schools — or any place where water rusts or corrodes tanks.

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For more facts circle 524 on Reply Card

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MOTOGEARS
for bracket mounting NEMA foot-type motors of any manufacture . . . widest application flexibility . . . up to 60 hp
ABILITY TO ACCOMMODATE WIDE RANGE OF MOTORS solves emergencies, minimizes downtime.
EASY MOTOR REPLACEMENT is accomplished by removing four bolts and separating coupling—oil drainage is unnecessary. Motor bracket assures rapid realignment.
RIGIDITY of high speed shaft and pinion is provided by straddle-mounting—important in coping with shock, reversing and heavy loads.
STURDY BRACKET MOUNT is securely bolted to drive housing and provides rigid mounting for motor.
LINK-BELT
MOTOGEAR

★ *Years-ahead design* — to harmonize with modern NEMA motors

★ *Stamina for the years ahead* — combining utmost compactness and highest efficiency for heavy-duty service

line of New, COMPACT GEARMOTORS...

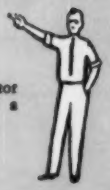
GEARMOTORS

the ultimate in compactness . . . with flange-mounted NEMA motors . . . up to 30 hp

UTMOST COMPACTNESS is provided by flanged connection of motor to gear drive.

ONE-PIECE HOUSING cuts maintenance, offers added strength and assures oil-tight, quiet operation.

BUILT-IN ALIGNMENT of motor is provided through use of a rabbet-fit motor flange.



NEVER before has a speed reduction line offered this combination of features: *oil-tight design* having a minimum number of openings, each protected by an effective oil seal; *quiet operation* resulting from precision machining and noise-absorbing, cast iron housing; *standardization* with only one low-speed gear set per drive size; *compactness* derived from a unique gear arrangement; *integral backstop* with positive-locking action, which may be installed at any time. Learn all about these advanced new drives—ask your Link-Belt office or authorized stock-carrying distributor for Book 2447.

LINK-BELT

ENCLOSED DRIVES

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 19,807

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"THIS LUBRICANT STOPPED THE 'FLAKING' OF ROLLING MILL GEARS"

says—VANADIUM-ALLOYS STEEL CO.

"The herring-bone gears in the drive unit of our 6-stand, 10-inch mill that rolls our high speed tool steels became noisy. Inspection showed definite signs of flaking of gears. This was in 1939. It was then we started to use LUBRIPLATE in them and we have not encountered any flaking trouble since."

L. M. Potter
Purchasing Agent

REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE

LUBRIPLATE LUBRICATION MAKES CARS AND TRUCKS RUN BETTER AND LAST LONGER

LUBRIPLATE H.D.'S. MOTOR OIL . . . THE OIL THAT NEEDS NO ADDITIVES

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For more facts circle 526 on Reply Card

BACKTALK about our past issues

Edited by Marjorie E. Weissman

Plant of 2005 A.D.

PLANT ENGINEERING:

"Would it be possible to get a glossy photographic print of the 'Plant of the Future' shown on page 86 of your January issue?

"I would also like any other information available on the plant for use as an illustration in our course in Plant Layout and Materials Handling." *James A. Apple, Professor of Industrial Engineering, Michigan State University, East Lansing, Mich.*

► We do not have another copy of the photograph used with the article, "Plant of the Future," but we do have one which is practically the same and a print of this is enclosed. We are indeed pleased that you find this of interest for use in your course.

We are sorry we do not have any information regarding the plant other than that published in the article. However, we are sending you a reprint of that section.—*Editors.*

Gamma Camera Hunt

PLANT ENGINEERING:

"On page 120 of the January 1956 issue of PLANT ENGINEERING there was an article on 'The Gamma Camera—Newest Atomic Seeing-Eye for Industry.' It was written by Mr. E. G. Fritz, General Manager, Isotope Production, Inc., Houston. A letter sent to this address has been returned as being insufficiently addressed.

"Since I would like to have more information on this subject, I wonder if you could give me the complete address of Mr. Fritz? Any help you can give us would be appreciated." *A. R. Hacker, Industrial Products Design, The Goodyear Tire & Rubber Co., Inc., Akron 16, Ohio.*

► The address we have in our files for Mr. Fritz is Isotope Products, Inc., 2703 Drexel Drive, Houston 6, Tex.—*Editors.*

Hose Problems

PLANT ENGINEERING:

"Will you please send me more information on the flexible hoses described on page 36 of your February, 1956 issue.

"We use metal hoses, 1¼ in. diameter and from 10 to 18 in. long, on the rotary joints connecting corrugated rolls and preheater drums. They carry steam at 170 psi and 370 F. The hoses seem to last for about six months or a year, in some cases for even less time." *Frank Ashton, Engineer, Schmidt Lithograph Co., San Francisco, Calif.*

PLANT ENGINEERING:

"Since we are plastic molders, using steam at 175 psi and approximately 350 F, we would appreciate receiving more information regarding the item 'Hose Flexes to Steamy Job' on page 36 of your February issue.

"Kindly send catalog or booklets describing the item and give the name and address of the manufacturer." *Bernard Tasson, Maintenance Engineer, Industrial Molded Products Co., Inc., Chicago, Illinois.*

► The resin-jacketed stainless wire braid hoses mentioned in our story are made by the Resistoflex Corp., 39 Plansoen St., Belleville, N. J. We are forwarding your requests to the company.—*Editors.*

Well Done

PLANT ENGINEERING:

"You were thoughtful to send me tear sheets of the article, 'Control Maintenance and You Cut Costs' which appeared in the December issue of Plant Engineering.

"This article seems to me to have been exceptionally well planned and executed; and, in my opinion, the personnel concerned in the Department of the Navy well deserve this recognition of their efforts.

"I would appreciate it if you would mail me 10 additional tear sheets of this article." *Rawlings S. Poole, Chief, Management Division, Maintenance Directorate, Office of Assistant Secretary of Defense, Washington 25, D.C.*

More on Sludge Treatment

► In September, 1955 we published an article by Howard K. Fitting of Standard Pressed Steel Co., titled "SPS Halves Waste Disposal Costs—New Treatment Cuts Sludge Volume 55 Per Cent."

Subsequently, Mr. N. S. Chamberlin, an industrial consultant for Wallace and Tiernan Inc., Belleville, N. J., took issue with certain statements made in the article and in the subhead written by us. His comments appeared in the Backtalk section of our February issue.

Summarized, they were to the effect that " . . . a proper analysis of the case . . . shows that the sludge volume was reduced, not because the process change was from gaseous chlorine and caustic to hypochlorite, but because the order of the chemical treatment was changed in relation to chlorination."

Following is Mr. Fitting's reply:

"Mr. Chamberlin is certainly correct in stating the sludge reduction in SPS' new waste treatment system results from the change in sequence of chemical addition.

"This fact seems to be correctly stated in PLANT ENGINEERING's subhead — the one in question—which states that 'process changes' cut the sludge problem. And certainly a reading of the text by anyone familiar with waste treatment plants

BETZ • *A Great Name In Water Conditioning*

Welcome visitor...

The Betz District Engineer is a welcome visitor wherever he goes. As our personal representative to industrial plants, petroleum installations, institutions . . . plants like yours, he plays an all-important role in our continuing efforts to engineer *controlled* water conditioning.

His job carries many responsibilities. For example, he

. . . instructs your plant operators in Betz-engineered water conditioning control techniques (chemical feed, water testing, chemical adjustment, blowdown control, etc.).

. . . makes regularly scheduled visits to your plant to review operating conditions.

. . . reviews plant control and offers "on-the-spot" constructive criticism and advice.

. . . checks testing procedures, test solutions and chemical feed equipment.

. . . inspects plant equipment and visually observes the results obtained.

. . . discusses any and all water problems with you and your operating personnel.

. . . prepares and submits a complete written report before leaving your plant.

And equally important, he works closely with the Betz headquarters engineering staff to assure the individual attention required for sound, economical water conditioning.

Next time a Betz District Engineer calls, ask him to explain how Betz *completely-integrated* water conditioning service can obtain results in *your* plant. He'll be happy to give you the details.

W. H. & L. D. BETZ, Gillingham & Worth Streets, Philadelphia 24, Pa. In Canada: BETZ Laboratories Limited, Montreal 1.

BETZ

CONSULTANTS ON INDUSTRIAL WATER PROBLEMS

For more facts circle 527 on Reply Card

use JOY SURGEPRUF

... THE NON-SKIVE COUPLING WITH THE DOUBLE-WEDGE GRIP

PERMITS THE USE OF MORE ABRASION-RESISTANT, RUBBER-COVERED HOSE

Insure longer wear in your hydraulic hose assemblies—and at the same time, save assembly time by avoiding old-fashioned skiving. Joy Surgepruf re-usable couplings make *both* advantages possible. Their exclusive "double-wedge" grip lets you use tough, abrasion-resistant, rubber-covered hose instead of the braided type —without any need for skiving the hose at the connection.

NO SPECIAL ASSEMBLY TOOLS REQUIRED

You need no mandrels or special tools to make up Surgepruf assemblies. No extra cost or special method is involved.

CAN BE RETIGHTENED WHEN LOOSE ON THE HOSE

Machine vibration or hose flexing can loosen any hydraulic coupling on the hose in time, but Surgepruf Couplings can be easily, quickly retightened on the job to stop a leak—*another* exclusive feature.

Surgepruf Hose Couplings are made to JIC Standards. Assemblies are available in many sizes and lengths, and in both single and double-wire reinforced types for medium-high and high pressure service respectively. *Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*

Write for FREE Bulletin 10-15

WAD 6150B-10

For more facts circle 528 on Reply Card

BACKTALK

would further indicate that this was the case.

"The purpose of this article was to report to PLANT ENGINEERING readers on the benefits of an overall system for treating wastes. It was not intended merely as a comparison between two methods of chlorination . . . although to facilitate analysis of the two overall systems in the text, the old and new methods were referred to respectively as the gas chlorination and sodium hypochlorite systems.

"Actually it was the switch to sodium hypochlorite that made the sludge reduction economically feasible. Our changes in processing sequence would have been too costly if we had retained the slower gaseous method of chlorine addition.

"Our use of liquid sodium hypochlorite resulted in the following savings: lower equipment costs; lower maintenance costs; and lower cost of the sodium hypochlorite per pound of available chlorine in this area.

"As for Mr. Chamberlin's comment about destruction of cyanates, it should be noted that the pH of SPS plating waste is below 9 as received." *Howard K. Fitting, Project Engineer, Standard Pressed Steel Co., Jenkintown, Pa.*

Water Treatment Reprints

PLANT ENGINEERING:

"From a copy of 'Nalco Abstracts of Current Articles on Water Treatment,' I learn that PLANT ENGINEERING published an article entitled 'Water Softening Methods' on page 106 of the August 1955 issue.

"Being very interested in this subject, I would appreciate it if you could forward me a reprint of the article." *P. J. De Wilde, Olivos, Argentina.*

Industrial Maintenance Again

PLANT ENGINEERING:

"Please send me your collection of reprints on preventive maintenance. Since we are in the process of establishing such a program at our mills here, I would appreciate receiving these reprints. Enclosed, you will find a check for $1.00." *E. T. Brown, Industrial Engineer, Maintenance, Canadian Cottons Ltd., Cornwall, Ont.*

▶ Coming your way, Mr. Brown, one copy of our industrial maintenance booklet.—*Editors.*

AIPE Directory

PLANT ENGINEERING:

"We work very closely with many plant engineers in the Pittsburgh area and we would like to have a complete national roster of your plant engineering members. If there is any charge for this list we will be pleased to pay it promptly." *A. R. Chambers, Jr., A. R. Chambers & Son, Inc., Construction and Industrial Supplies, Pittsburgh, Pa.*

▶ We certainly appreciate your interest in the American Institute of Plant Engineers. We are sending you a copy of the Institute's National Directory, which contains the names of more than a thousand members and details about the organization of some 35 plant engineers' societies. Price of the Directory is $5.00 a copy.—*Editors.*

Venturi Fitting Design

PLANT ENGINEERING:

"More information on the venturi vacuum fitting described in the February, 1956 issue of PLANT ENGINEERING, on pages 102 and 103, would be appreciated." *Ray F. Clark, Project Engineer, Spaulding Moss Co., Boston, Mass.*

▶ Since this fitting was designed by the Glenn L. Martin Co., we are writing to their Mr. William B. Welling asking him to send you any additional details they may have on its design.—*Editors.*

Rejuvenating Water Wells

PLANT ENGINEERING:

"Mr. Lewis' article on 'Water Well Capacities' in your February, 1956 issue, page 112, was much appreciated here as we are starting to feel the pinch now that our wells are gradually losing capacity.

"We are having some trouble locating any authoritative literature on wells. None of our handbooks even mentions the subject. Can you recommend any source of information?" *A. L. Webre Jr., Chief Engineer, Glenwood Cooperative, Inc., Napoleonville, La.*

PLANT ENGINEERING:

"I was very much interested in your article 'Water Well Capacities' in the February, 1956 issue. Unfortunately I cannot find the address for Calgon, Inc.

"Would you please ask them to forward information on their product 'Weltone' and recommended procedures for washing wells?" *William F. Corse, Secretary, C. G. Summers, Jr., Inc., New Freedom, Pa.*

▶ We are writing to Mr. George Motheral, of Hagan Corp., parent company of Calgon, Inc., P.O. Box 1346, Pittsburgh, Pa., asking him to send you information on "Weltone" and water well rejuvenation.—*Editors.*

Annual Index

PLANT ENGINEERING:

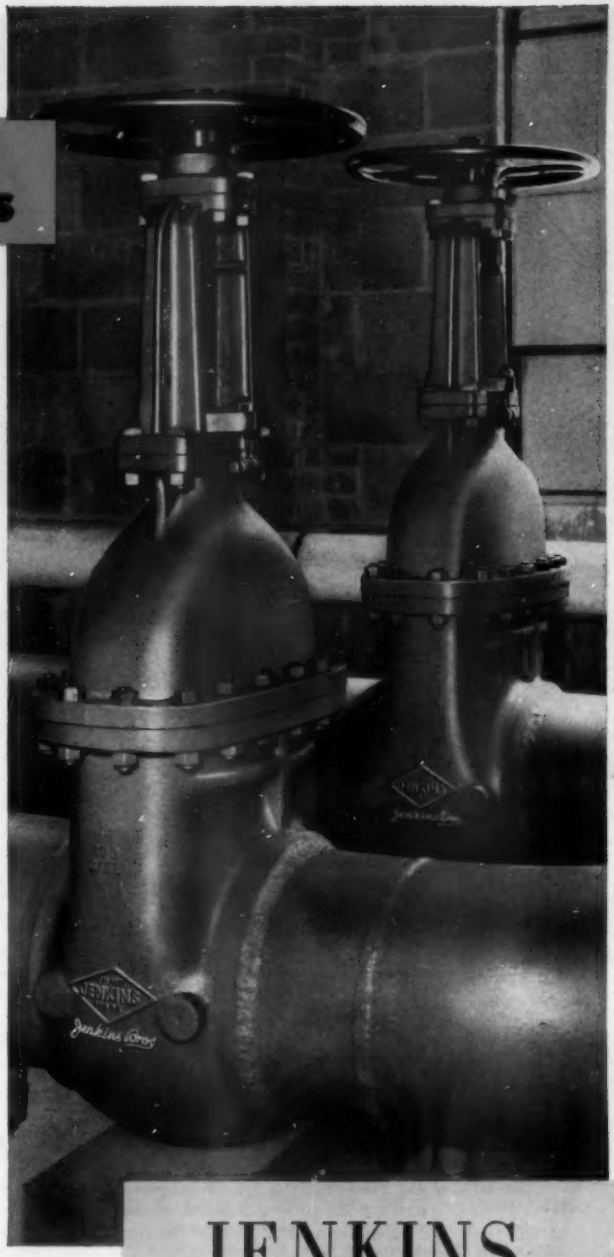
"Please send me a copy of the 1955 annual index for PLANT ENGINEERING. We wish to keep it available for reference use." *Joseph F. Russell, Librarian, Engineering Library, Kaiser Engineers, Div. of Henry J. Kaiser Co., Oakland, Calif.*

▶ Copies of the index for 1955 are available and we are glad to send you one with the compliments of the editorial department.—*Editors.*

For higher pressures
— higher temperatures

JENKINS CAST STEEL VALVES

serve the systems planned for lowest operating costs



The steadily increasing number of power generation and industrial processing installations of Jenkins Cast Steel Valves is clear evidence of economy-minded selection by valve specifiers and buyers.

Jenkins Cast Steel Valves offer any required combination of casting alloys and seating metals for any service up to 600 lbs. pressure and 1000°F. temperature. Along with specified ratings, buyers get the plus of Jenkins *extra value*, in design, in construction, in quality standards.

Test Jenkins Cast Steel Valves at the most punishing control points in your plant. Compare performance, and you'll see how they set new standards for long-range economy.

PATTERNS

Gates 2" to 24". Globes and Angles 2" to 10". Swing Checks 2" to 12". Non-return, stop and check Globes and Angles 4" to 10".
Screwed, Flanged, or Weld Ends.

PRESSURES

150 lb. — 300 lb. — 400 lb. — 600 lb.

PRESSURE CASTING ALLOYS

Carbon Steel (150 lb.)
Carbon Molybdenum Steel — 300, 400, 600 lb. Valves
Chromium Molybdenum Steel

SEATING METALS

H Monel
13% Chromium Stainless Steel
Carbon Molybdenum Steel, Stellite faced
AISI Type 316 Stainless Steel

JENKINS
LOOK FOR THE JENKINS DIAMOND
VALVES
SINCE 1864 TRADE JENKINS MARK
Jenkins Bros

FOR COMPLETE SPECIFICATIONS, GET THIS CAST STEEL VALVE CATALOG

It describes all patterns, casting alloys, and seating combinations, with details of the *extra value* design and construction features. Gives pressure-temperature ratings, dimensions, and other technical data. Get a copy from your Jenkins Valve Distributor, or write: Jenkins Bros., 100 Park Ave., New York 17.

SOLD THROUGH PLUMBING-HEATING AND INDUSTRIAL DISTRIBUTORS

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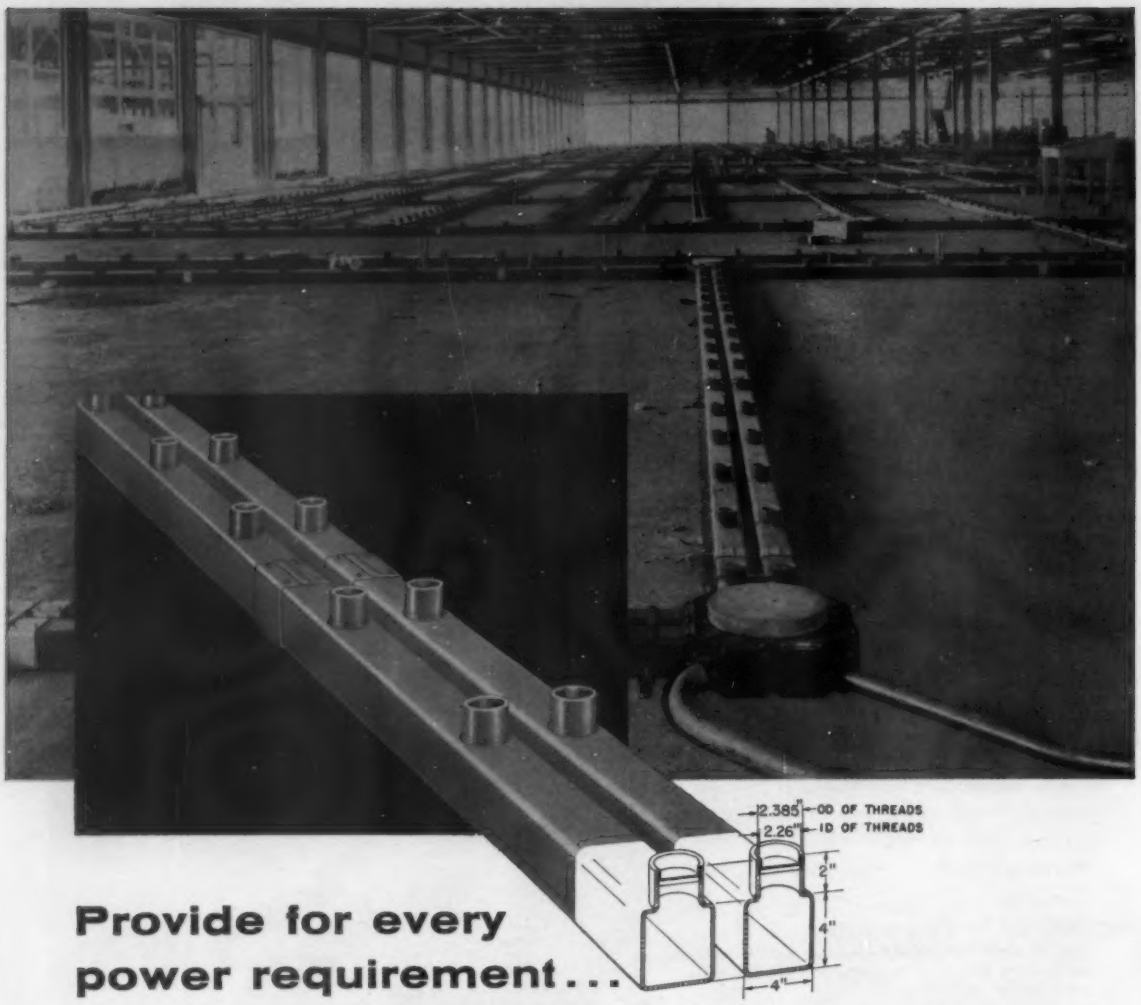

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INDUSTRIAL UNDERFLOOR ELECTRICAL RACEWAYS

Versatile in design, National Electric Jumboduct offers plenty of capacity for production line wiring . . . eliminates the hazard of overhead wiring . . . permits flexible, attractive plant layouts by providing for readily accessible electrical distribution in the floor at a minimum cost.

A Jumboduct system in your plant means:

Plenty of capacity

4" x 4" Cross Section—more room for wires

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2" pipe threaded outlets every 24" permits exact location of equipment

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- Easy-to-handle 10' lengths
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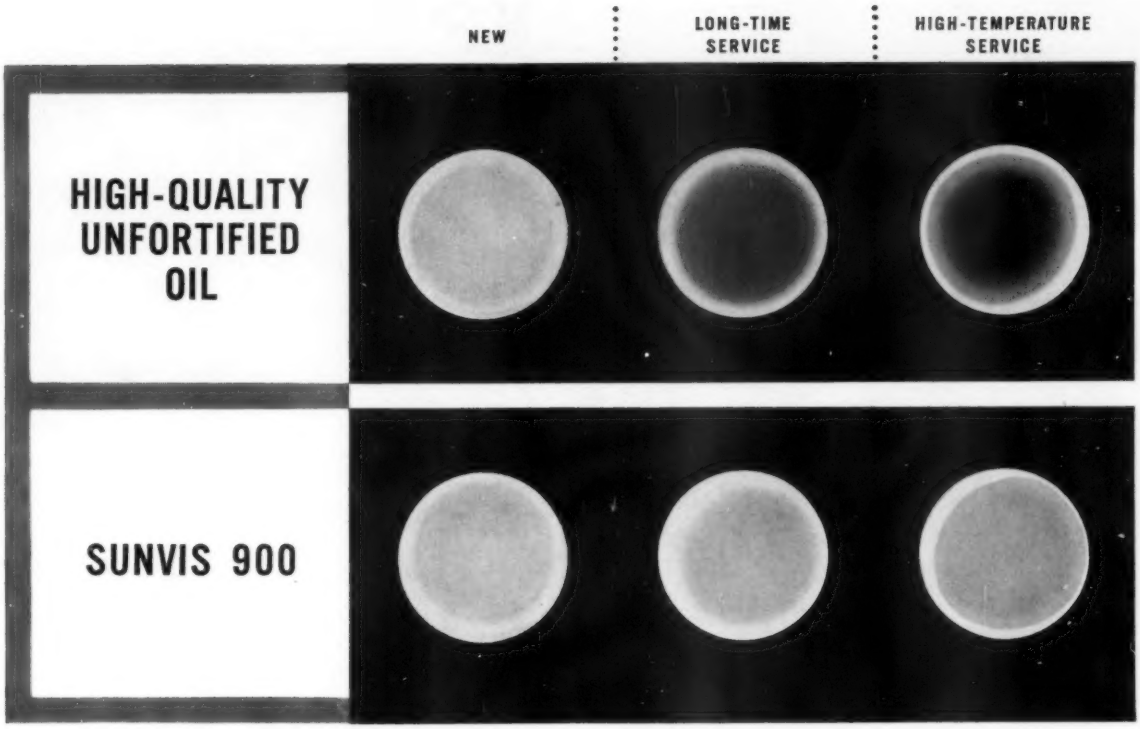

Oil color tests show

WHY SUNVIS 900 OILS SAVE YOU MONEY IN CIRCULATING AND HYDRAULIC SYSTEMS

Color means very little in brand new oils. But...color *change* during service can mean a lot. While minor darkening is seldom serious, radical color changes indicate danger, except, perhaps, in a highly detergent oil.

Either the oil is contaminated by foreign matter, or as in the pictures, the oil has oxidized from heat and long use. The products of oxidation darken the color of ordinary oils...clog valves and filters, cause excessive maintenance.

Compare the appearance of the used Sunvis 900 with the appearance of the other used oil. The color of used Sunvis 900 is practically the same as new Sunvis 900. There is not a sign of oxidation products.

Here's proof that Sunvis 900 oils will last longer and provide the extra needed resistance against the high temperature "hot-spots" of typical hydraulic and circulating systems. *For the long run, a Sunvis 900 oil is the most economical oil you can buy.*

For more information about Sunvis 900 oils, see your Sun representative, or write for Technical Bulletin 35. Address SUN OIL COMPANY, Philadelphia 3, Pa., Dept. I-31.

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY

Philadelphia 3, Pa.

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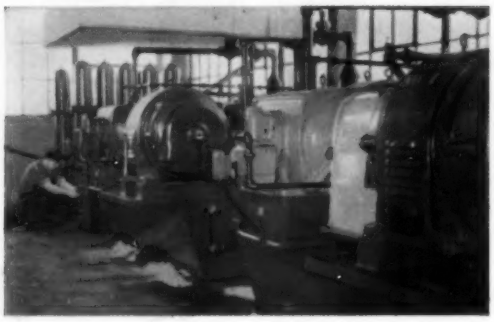
In Canada: Sun Oil Company Limited, Toronto and Montreal

SUNOCO®

High-Pressure Pumps, below, each handle 54 gpm of Sunvis 931 at 2500 psi. Unique closed-loop hydraulic system, left, features color-coded piping.



NEW CENTRAL HYDRAULIC SYSTEM PROTECTED BY SUNVIS 931 OIL

The new variable-pressure hydraulic system at Columbia Records in Bridgeport, Conn., delivers oil at 2500 psi to as many as 40 injection molding machines. Round-the-clock production of micro-groove records depends on the reliability of this system.

Columbia picked Sunvis 931 because their tests and experience have shown it doesn't form carbon or leave harmful deposits...even after years of use. Because of their long life, Sunvis 900 oils are the least expensive oils you can buy for tight circulating systems.

This is just part of the story about Sunvis 900 oils. Why not talk them over with your Sun representative the next time he calls. Or write to SUN OIL COMPANY, Philadelphia 3, Pa., Dept. I-32.

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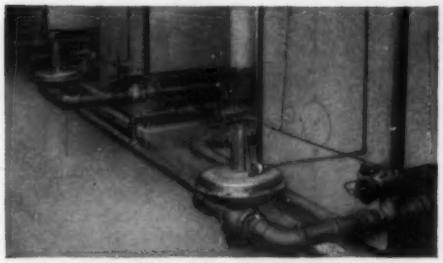
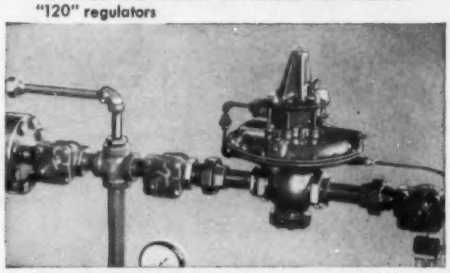
Gas does it best!

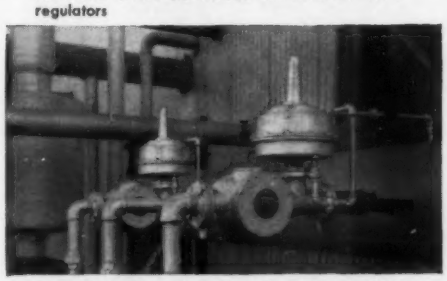
For All Industrial Heating Purposes



FURNACE AND BOILER CONTROLS with Rockwell "120" regulators



KILN AND OVEN CONTROLS with Rockwell "1001" regulators



GAS ENGINE CONTROLS with Rockwell "014" regulators

ROCKWELL *Gas Pressure* REGULATORS

A SIZE AND TYPE FOR EVERY NEED

Let Rockwell Gas Pressure Regulators **Improve Your Combustion Control**

No matter what the process when you use gas for heat or power, you need *good pressure regulation* to obtain *good combustion*. A constant, even pressure at the burners means uniform quality in your end products . . . and maximum fuel economy, too.

Rockwell makes a complete line of regulators for either high or low pressure burner control. Among them is the right type and size for any specific application. To help solve your problems in combustion control we invite you to make full use of our field engineering service. Use the handy coupon or write fully today.

Clip Coupon—Mail Today!

Use this handy coupon for literature, a quotation or free engineering assistance

Rockwell Manufacturing Company **Dept. 102D**
Pittsburgh 8, Pa.

Gentlemen:

Please send me bulletin describing Rockwell regulators for low pressure burner control ☐. For high pressure burner control ☐. Please have your field representative call ☐.

Your Name_____

Company_____

Street_____

City_____ Zone____ State_____

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PLANT ENGINEERS' DIGEST so those who rush may read and know what's new

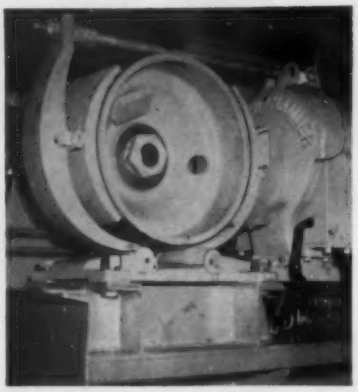
Edited by Marjorie E. Weissman

Ductile Iron for Brake Wheels

DUCTILE IRON brake wheels and other parts have been developed by Cutler-Hammer, Inc., Milwaukee, Wisconsin, to replace similar items formerly made of cast steel. The new wheels and other parts are used on the company's magnetic brakes. Since, in service, the brake wheels receive heavy impact shock every time the brake is applied, the toughness of ductile iron makes it a natural choice for this application.

The magnetic brakes were designed for heavy duty cranes, steel mill auxiliaries, coal or ore bridges and materials handling equipment, where powerful motors running at high speeds must be stopped quickly and frequently.

According to Howard E. Hodgson, mechanical engineer at Cutler-Hammer, Inc., the ductile iron brake wheels, which range in diameter from eight to 23 in. and in weight from 40 to 400 lb, were tested under strenuous conditions. No patch welds developed in the brake lining even when the wheels were operating at 500 F.



Ductile iron has replaced cast steel in brake wheels for magnetic brakes

Use of ductile iron thus eliminates a difficulty occasionally experienced with steel wheels, hardened to spring temper, in which, under high temperature operation, particles of metal from the wheel weld together and imbed themselves in the friction lining. This results in serious scoring of the wheel face.

Although ductile iron brake shoes were scored by rivets after the lining wore, operating temperatures were reduced and the tests were continued at a practical operating temperature of 300 F. The score marks healed, and the surface of the wheel developed a sheen and wore evenly. *From a release of International Nickel Company, Inc., New York, N. Y.*

High-Piled Stock Versus Fire Protection

A SERIOUS threat to many industrial plants is that of high piling of stocks in warehouses and storage areas.

For every foot added to the height of combustibles beneath automatic sprinklers the work load placed upon the operating sprinklers increases. A limit is reached when the total rate of heat release by the fire equals or

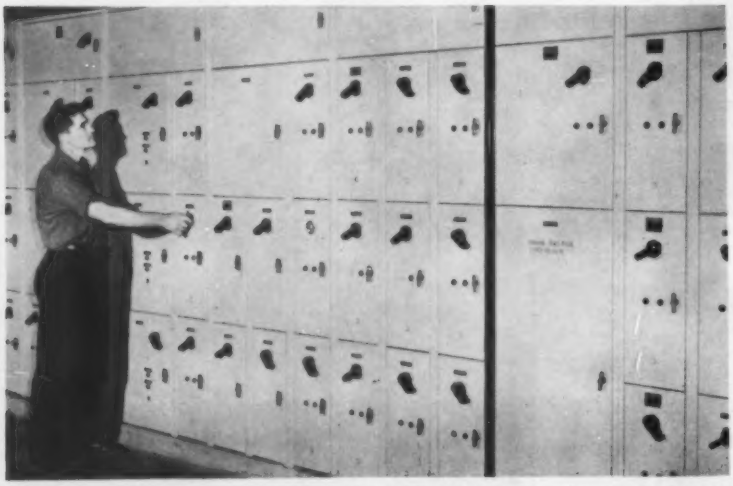
(Continued on page 42)

Automatic Coal Handling System Maintains Check at Transfer Points, Bunkers

AUTOMATION has reduced by two-thirds the time required for the coal processing operation at The Mead Corporation's Chillicothe, Ohio, Division, where a 990-ft conveyor handles an average of 300 tons of coal per day for its steam plant.

Major component in the automatic system is an electrical control engineered by our Industry Control department. This control features a built-in illuminated diagram by which an operator maintains a remote check on all coal processing.

One operator is stationed at the coal crusher house which contains the control panel with an illuminated, schematic diagram. From this location he can follow on the mimic panel the need for coal at transfer points or at either of two bunkers in the power house.



Switching operations for automatic coal handling are performed on control panel

This enables the operator to select the correct movement for the coal and to direct its flow to the storage yard or the power house via the conveyor. If he directs it to the power house he can further shunt it to either of the two bunkers.

The other operators are stationed at the power house, one-eighth of a mile away, to make sure the coal flows as directed.

Varicolored lights on the diagram permit easy and constant checks on the flow of coal to all transfer points.

The new system has reduced to eight hours the former 24-hour continuous operation necessary to move enough coal to feed the boilers.

Workmen now perform their duties inside comfortably-heated enclosures, whereas in the past they had to spend considerable time in the open.

While 300 tons of coal per day is the present average, the new system permits handling twice that tonnage if boiler requirements make it necessary. *From a release of General Electric Company, Schenectady, New York.*

Now a new standard of safety in low-voltage switchgear

Test position with doors closed

This exclusive I-T-E low voltage switchgear feature establishes a new standard of safety in testing circuit breakers. It offers the additional advantages of reduced handling; less maintenance; convenient "tagging out"; better dust protection; easier circuit identification. And all are yours at no increase in cost in the compact, modern design of I-T-E low-voltage switchgear.

For complete information, contact your nearest I-T-E sales office. Or write for Bulletin 6004B. I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY
Switchgear Division

For more facts circle 533 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 40)

exceeds that which the progressively fusing sprinklers are capable of absorbing. As this unabsorbed heat accumulates and more heads fuse, pressure falls, as does individual sprinkler discharge. Spread of fire may then be unabated.

Even though a sprinkler system may be hydraulically engineered to deliver water at a high discharge density, piles may be so massive and dense that sufficient water cannot permeate the pile to do an effective cooling or fire control job. Basic rules of good practice in providing safer warehousing procedures include the following:

Consult both your insurance carrier and the public fire department as to what constitutes the limiting floor area per pile and the limiting height for which effective fire control can be expected. Lines painted on the floor to establish pile limitations are helpful.

Top of stock should clear sprinklers by at least 3 ft for adequate development of sprinkler discharge pattern.

Main trucking aisles should be a minimum of 12 ft wide; cross aisles at least 8 ft wide.

Not less than 3-ft clearance should be maintained between piles and side walls to allow for expansion of stock as it becomes water soaked, to avoid lateral pressure against structure. Similar consideration applies to piling of stock around supporting columns.

If stock is likely to be weakened by water absorption, racks or pallets should be used to minimize toppling of piles under sprinkler discharge conditions. Skidding of stock at least 4 in. off floor greatly reduces possible water damage.

Smoke escapement or venting facilities should be provided through the use of structural roof ventilating media unless window area in external walls, especially with 5 to 6 ft of the ceiling can be utilized for smoke venting. *From Sentinel, published by Factory Insurance Association, Hartford, Conn.*

Lock for Rivet Refrigerator

ALUMINUM ALLOY rivets used in our plant must be refrigerated to slow the aging process and keep the metal in a ductile, "as quenched" condition, so that the rivets can be easily headed.

Device automatically locks refrigerated cabinet containing rivets when the temperature rises above critical —10 F

Most rivets used are maintained at —20 F. At temperatures higher than —10 F the metal hardens and may crack during the heading operation, so heating above that temperature warrants discarding or reprocessing the rivets.

To assure control of refrigerated rivet quality, an automatic lock has been developed by the Webber Engi-

(Continued on page 44)

Phenolic Resin-and-Vinyl Primer Up-Grades Knotty Pine Lumber

WITH THE USE of a phenolic-vinyl primer-sealer, economy grade, knotty pine lumber can be substituted for clear grades, where a painted surface is desired, without sacrificing the long service life expected from better grade lumber.

Distinguishing characteristic of economy grade lumber is the large number of "live" knots it contains. The knots are the result of cutting lumber from logs that have live branch ends in the clear trunk wood.

Where knots are not sealed and the lumber is left unprimed, there are distinct stages of deterioration of the finished paint surface. The appearance of a brown discoloration is followed by cracking and peeling before remaining board requires painting.

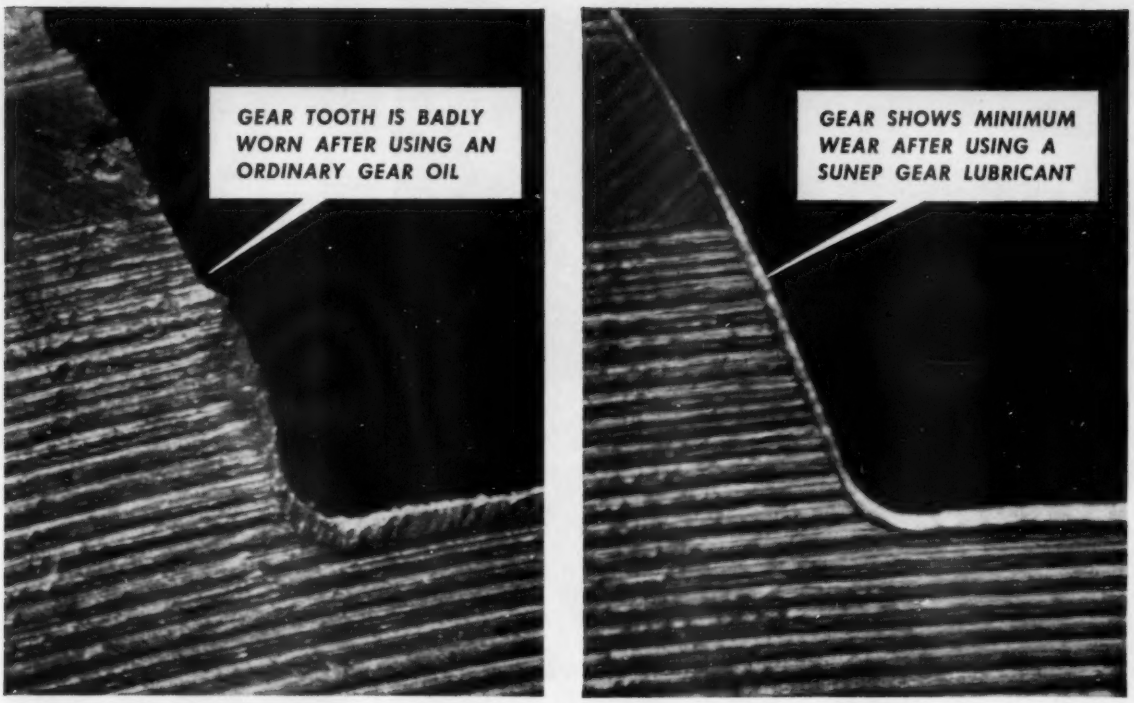
Discoloration is the result of an excessive amount of resinous matter consisting of rosin, fats and turpentine, present in the knot area. When the knots are painted, the resin, which is compatible with the paint, is absorbed by the primer coating. Discoloration does not come about until the resin penetrates the outside coating. The phenolic-vinyl coating prevents discoloration by sealing the excessive pitch into the knots.

In one test, one half of a fence was painted with the primer-sealer, while a conventional primer was applied to the other half of the fence. The entire fence was finish coated and exposed to the weather for more than five years. For all practical purposes, paint failures were non-existent over the knots covered with the primer-sealer with the vinyl and phenolic resin base. The knots covered with the conventional sealer bled through the finish coat.

In another test application, the undiluted sealer effectively covered the lower half of an unpainted knotted wood panel. The upper half had been painted with standard primer which left the knot clearly visible. Two coats of house paint were then applied and the panel was exposed to a mercury vapor ultraviolet light source for 450 hours. Knots on the lower half of the panel did not bleed through the finish coat. *From Bakelite Review, published by Bakelite Company, Div. of Union Carbide & Carbon Corp., New York.*

Undiluted knot primer and sealer covers lower part of unpainted, knotted panel

Upper half of same panel is coated with a standard primer, leaving knot visible



COMPARATIVE TESTS on identical new worm gears demonstrate superiority of Sunep Gear Lubricant. Gear on left, using a compounded cylinder oil, shows excessive wear at 70 hours. Gear on right, protected by Sunep, shows minimum wear after running over 200 hours!

HERE'S PROOF SUNEP GEAR LUBRICANTS MINIMIZE WEAR

Sunep Gear Lubricants cut power losses...protect against overloads ...lengthen gear life...reduce maintenance costs and replacements.

During recent tests gear units protected by Sunep Gear Lubricant showed an absolute minimum of wear when run at normal rated capacity. There was no indication of scoring or wear even when run at overloads up to 118%! Power consumption was reduced up to 25%. Damage from shock loads was nil.

In addition to outstanding load-carrying ability, Sunep Gear Lubricants are extremely stable, non-corrosive, prevent rusting, keep gears and bearings clean.

For complete information about how Sunep Gear Lubricants can help give longer life to your worm gear units, see your Sun representative...or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. PY-4.

SUNOCO®

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY PHILADELPHIA 3, PA.

IN CANADA: SUN OIL COMPANY, LTD., TORONTO AND MONTREAL

For more facts circle 534 on Reply Card

WANT LONGER BELT LIFE?

SWITCH TO IMPERIAL Innerlocked* BELTING

26 TIMES EXPECTED LIFE was the record of this Imperial Belt in a large foundry.

IMPERIAL BELT on this elevator lasted 8 years longer than belt used previously.

Exclusive stitching and impregnation give maximum wear resistance . . . lower belting cost

There's one sure way to reduce your ultimate belting costs . . . and that's by getting extra service life out of every belt you buy.

Imperial's exclusive INNERLOCKED* stitching and impregnating processes were developed to produce stronger, longer-wearing belts. They have been proved in hundreds of installations.

Plies won't separate

INNERLOCKED stitching permanently binds plies together. Stitches will not run even if a thread is broken or cut. Additional wear resistance is obtained by the use of special impregnating compounds developed by Imperial. These compounds lubricate, toughen and preserve the heavy-duty hard silver duck fabric which has a tensile strength exceeding 800 lbs. per inch of width.

Tell us your belting needs

Imperial Belts are job-designed for specific operating conditions. They cost less to use than any belting manufactured. Write for Catalog 54-3, describing your requirements.

**INNERLOCKED—Reg. trademark of Imperial Belting Co.*

Imperial INNERLOCKED * BELTING

First in stitched canvas belting for over 45 years

You expect more from Imperial . . . and you get more!

Imperial Belting Company

1759 S. Kilbourn Avenue
Chicago 23, Illinois

For *new* conveyors and elevators, specify and insist on Imperial for lowest ultimate belt cost. Write for Catalog 54-3.

For more facts circle 535 on Reply Card

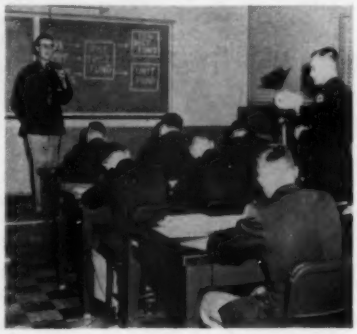
PLANT ENGINEERS' DIGEST

(Digest begins on page 40)

neering Corp., Indianapolis, Ind. The refrigerated cabinet containing the rivets is fitted with a non-electrical, thermostatically controlled device that locks it when the temperature rises above —10 F. Rivets in a cabinet locked by the automatic device are unsuitable for use and must be reprocessed. Only quality control inspectors have keys to the cabinets. *From a release of Glenn L. Martin Company, Baltimore, Md.*

Instruction by TV

THREE COURSE sections, conducted at the Army Signal School, Fort Monmouth, N. J., and each located in a different classroom, were recently in-



Portable TV camera (arrow) makes possible instruction of several classes

structed simultaneously by one instructor through the medium of television.

A portable TV camera, weighing 5 lb, was mounted on a tripod in the master classroom. The camera was controlled by the instructor. Two conventional-type, 21-in. television receivers were installed in the other classrooms to receive the lecture. Microphones enabled students to ask questions and to answer questions posed by the instructor. *From a release of General Precision Laboratory Inc., Pleasantville, N. Y.*

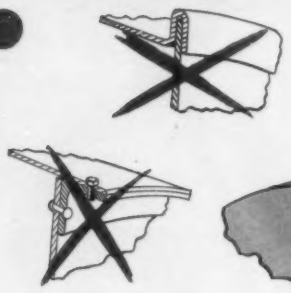
Color Conditioned Machines

COLOR DYNAMIC painting of machines, particularly lathes and other metal working machines, has lessened eye fatigue of workers, improved production, boosted morale and reduced injury hazard in our Belleville, New Jersey plant. It has also been an incentive toward good housekeeping.

Body parts of machines are painted

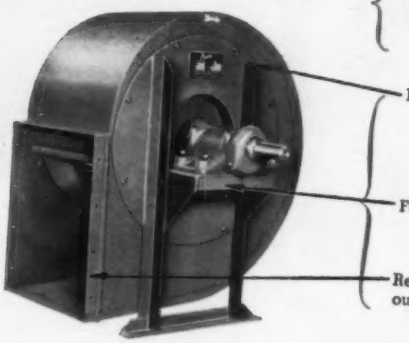
For more facts circle 536 on Reply Card——→

Bayley FAN-A-GRAFICS
For Equipment Engineers

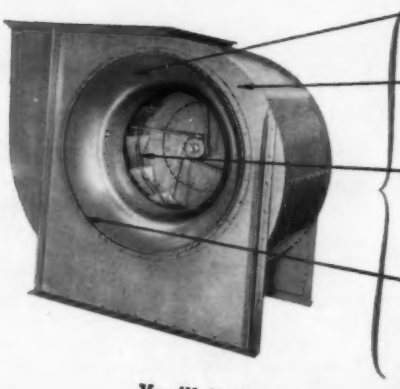


Craftsmanship

Presented here for your information are some basic facts revealing how superior quality Fans are built by a manufacturer credited with a long history of fine craftsmanship in production.



FEATURE	FUNCTION	BAYLEY Standards
Strong, light, continuous inside-welded housing seams, with smooth, neat exterior.	To avoid leaks, springing, warping, crinkling, vibration. Easily painted or insulated for seamless, trouble-free protection.	All types and sizes of fabricated steel housings.
Reversible Housing	Quickly available for any discharge position, permits field changes, simplifies or eliminates detailed preliminary layouts.	Type F and AP Fans to size 365 inclusive. Other styles to maximum practical.
Fabricated Brackets	Durability, maximum strength-weight ratio, matched to specific load requirements.	All types and sizes except very small fans.
Reinforced, system-ready outlet piece.	Quickly-made, tight connections. No "field manufacturing" required.	All types and sizes.



Smooth-spun, closely fitted Housing and Wheel Inlets.	Minimize turbulence and recirculation losses, provide maximum *realized* efficiency.	All AP Fans.
Ample Housing Side and Scroll Gauges (Made practical and effective by seam-welding.)	Uniformly high strength, stiffness, and corrosion resistance minimizes "breathing", vibration, perforation.	All types and sizes.
Accurately Prepared and Applied Wheel Blade and Shroud Reinforcement.	Maximum strength with minimum shaft load reduces moment of inertia, facilitates precision balance, minimizes vibration.	Type F and AP Wheels, according to size and speed.
System-ready Inlet Ring of ample length and stiffness.	Facilitates quick connection to inlet duct or accessory, originally or at a *later time*. System can be altered or extended without reconstructing or modifying fan.	All types and sizes. (Need not be explicitly specified.)

You'll find all these as well as many other quality features in BAYLEY Fans.
Send for Complete Line Bulletin CL-551.

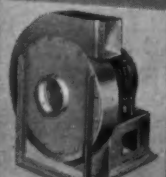
Our 100th Anniversary of Craftsmanship

PLEXIFORM
Forward Curve

AEROPLEX
Backward Curve

VENTILATING SET

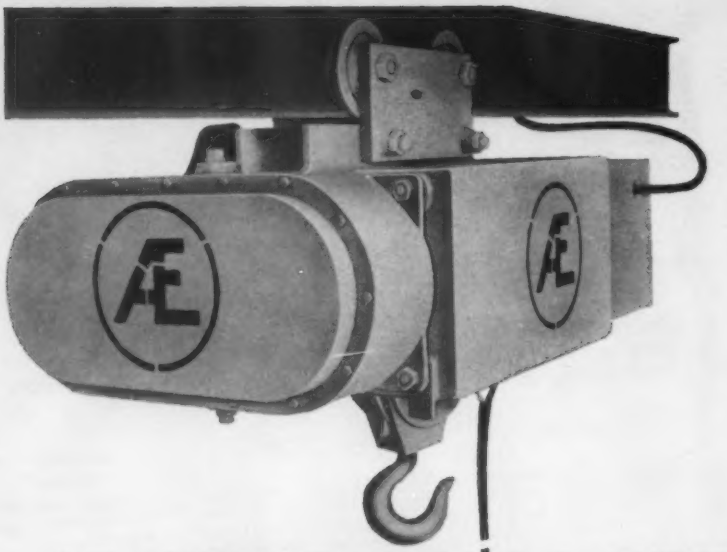
TYPE EX
Industrial Fan



TYPE H
Pressure Blower

Engineered
AIR HANDLING EQUIPMENT

BAYLEY BLOWER COMPANY



AE STANDARD LO-HED

the hoist that gives you important **extras** *at* **no extra** *cost*

FROM THE STANDPOINT of engineering and materials, Standard Lo-Hed is the most modern heavy duty hoist ever put on the market. This is a really heavy duty hoist, *not* one that wears out in a few years. It's made in 2- and 3-ton capacities... quantity-produced for moderate prices and delivery straight from stock. More than that, Standard Lo-Hed gives you—*for free*—a whole group of extras that usually cost real money. Among these extras are:

- Hoisting speed: 20 ft. per minute;
- Lower limit safety switch;
- Spider for gears to permit checking with cover off;
- Anti-friction thrust bearing on hook nut;
- A 110v pilot circuit on AC voltages of 220v and up;
- All-steel, welded construction combining light weight and rigidity.

Standard Lo-Hed Hoists are pulling down materials handling costs the country over. They're available in your choice of bolt suspension, plain trolley, hand-geared trolley and motor trolley types. Write for fully descriptive literature.

★ ★ ★ ★ ★

If you have special heavy duty requirements, AE's feature-packed Customized Lo-Hed could be the perfect answer. It's engineered in capacities from ¼-ton to 12 tons, and in five suspension types. Talk it over with your local Lo-Hed representative.

AMERICAN ENGINEERING COMPANY

DEPT. H-164, WHEATSHEAF LANE & SEPVIVA ST., PHILADELPHIA 37, PA.

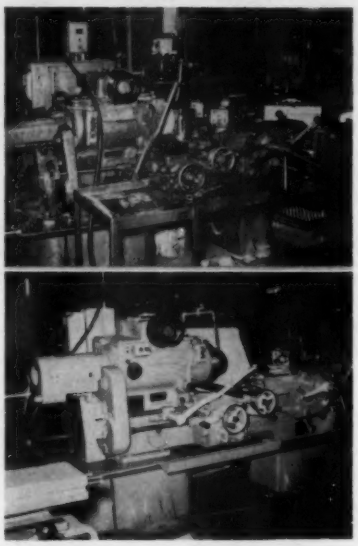
Canadian Subsidiaries: Affiliated Engineering Corporations, Ltd., Montreal, P. Q. ... Bawden Industries Ltd., Toronto, Ont.

AE products are: Taylor, Perfect Spread and Vibra-Grate Stokers, Hele-Shaw and Hydramite Fluid Power, Lo-Hed Hoists, Lo-Hed Car Pullers, Marine Deck Auxiliaries.

For more facts circle 537 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 40)



Original grey paint (top) failed to distinguish one part of machine from another. Color dynamic painting (bottom) ensures greater safety, less fatigue

in vista green enamel, which has a receding effect on the machine, leaving the working parts to stand out.

Focal ivory provides light reflection of 74 per cent, so this color is applied to the beds and splash pans and shields of the machines to give clear dimension to work on both ferrous and non-ferrous metals.

On-off switches, machine guards, crushing or cutting edges and electrical boxes are painted focal orange, a color which makes these parts readily apparent to anyone approaching the machine.

The reflective value of the dark grey paint formerly used on all parts of the machine, was about 5 per cent a short while after application. Controls on machines painted in this color were barely visible 10 ft away. *From a release of Walter Kidde & Company, New York, N.Y.*

Plated Saw Blades Cut Wood

MAINTAINING a close tolerance on a multi-cut operation in the production of yard sticks, paint paddles and other narrow strip wood products was a problem for the Adrule Manufacturing Corporation of Albany, Calif.

Ten strips of wood were cut simultaneously in a machine using standard circular saw blades. With these blades, however, the required tolerance of 4/1000 in. could not be maintained.

For more facts circle 538 on Reply Card

SQUARE D SAFETY SWITCHES

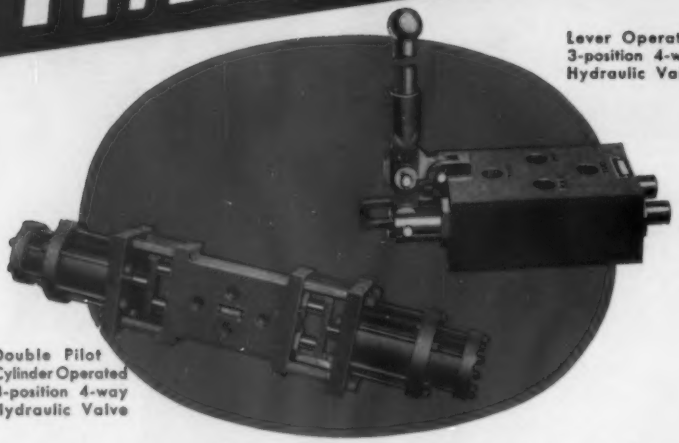
-Never out of First Place in 50 Years!

COMPARE... line for line and feature for feature
THEY COST NO MORE... WHY SETTLE FOR LESS?

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY

Quick-As-Wink® Hydraulic Valves



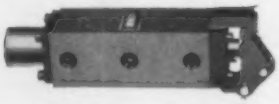
Lever Operated 3-position 4-way Hydraulic Valve

Double Pilot Cylinder Operated 3-position 4-way Hydraulic Valve

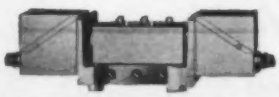
Hand and Pilot-operated Types for Water or Hydraulic Oils to 5000 psi.

• Quick-As-Wink Hydraulic Control Valves meet the most exacting requirements. These valves are fully balanced in any position. Patented design includes hydraulically balanced U-packers. Packers are floated while crossing the valving ports, thus assuring long life, and expanded by internal valve pressure to provide a tight seal. Maintenance is extremely low and usually can be done quickly in the field, avoiding the delay of returning valves to the factory for servicing, or the need of maintaining large standby inventories. For long, dependable, trouble-free service, specify Quick-As-Wink Hydraulic Valves. Write for Bulletin No. 531 and the fully descriptive Data Sheets. They give complete details. Write *today!*

Ask us also about . . .

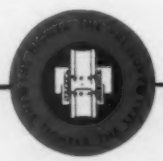


CAM OPERATED SINGLE PLUNGER VALVE 3/8" to 3/4" sizes. Operated by rotating cam or land on reciprocating device.



DOUBLE SOLENOID "O-TYPE" VALVE for pressures up to 125 psi. Widely used as pilot valves and for operating air cylinders.

Quick-As-Wink®
AIR AND HYDRAULIC
Control Valves



Hand, Foot, Cam, Pilot, Diaphragm and Solenoid Operated

Mfd. by C. B. HUNT & SON, INC., 2088 East Pershing St., Salem, Ohio

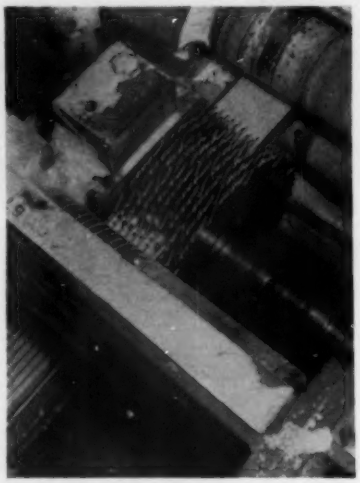
For more facts circle 539 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 40)

Downtime periods of three hours were frequent in order to insert newly sharpened saw blades.

Use of saw blades, electrolytically plated, has enabled the company to obtain a satisfactory average of 6000 three-foot strips for each sharpening. Minimum tolerances are maintained without difficulty. The blades wear more slowly, cut faster and run cooler than the standard blades. *From a release of Price & Rutzebeck, Hayward, Calif.*



On multi-cut operation, chrome plated saw blades enable close tolerances to be held on a run of 6000 wood strips

Do's and Don'ts on Abrasive Belts

1. Consult your coated abrasive source for testing help and for time saving methods—as well as for the usual belt, grit and contact wheel recommendations.

2. Test both aluminum oxide and silicon carbide abrasive belts to fit your finishing recommendations. Resinized (resin-over-glue) belts cut faster but do not produce finishes which buff out as fast as those produced on glue-bonded belts.

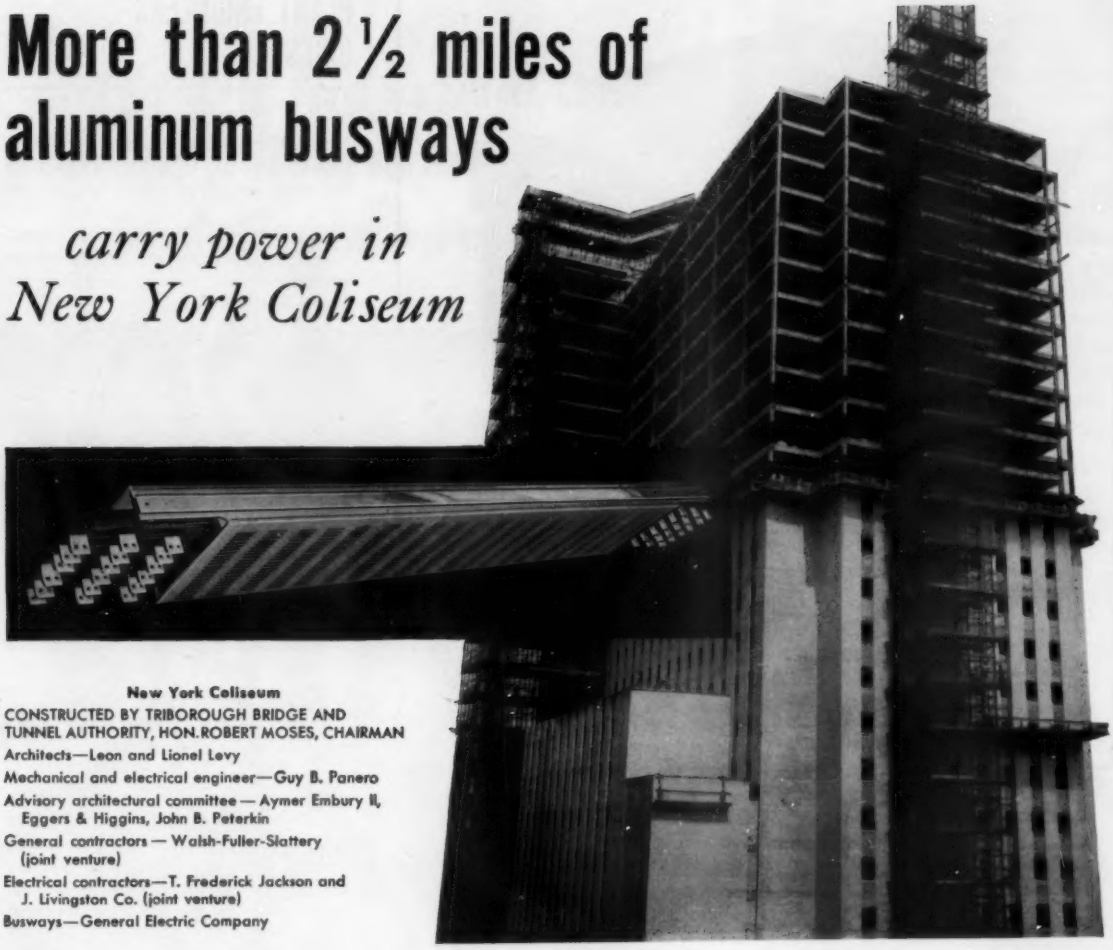
3. Make sure that the finish obtained is carried to the point where the buffing prior to plating is easy. This reduces rejects and buffing time.

4. Provide for proper handling of parts before and after polishing to eliminate needless damage and rejects. Paper interlayers or compartmented trays will provide excellent parts protection in handling before plating.

5. Provide proper inspection of

More than 2½ miles of aluminum busways

carry power in New York Coliseum



New York Coliseum
CONSTRUCTED BY TRIBOROUGH BRIDGE AND TUNNEL AUTHORITY, HON. ROBERT MOSES, CHAIRMAN
Architects—Leon and Lionel Levy
Mechanical and electrical engineer—Guy B. Panero
Advisory architectural committee — Aymer Embury II, Eggers & Higgins, John B. Peterkin
General contractors — Walsh-Fuller-Slattery (joint venture)
Electrical contractors—T. Frederick Jackson and J. Livingston Co. (joint venture)
Busways—General Electric Company

Important Innovations in Coliseum

New York City's new Coliseum is modern in every detail, particularly in its electrical distribution system. This 26-story office building, combined with 365,000 square feet of display space, has one of the first major installations of a higher voltage distribution system (480Y/277 volts). More than 2½ miles of busway incorporating aluminum conductors were used to feed power to this huge structure.

Higher Voltage System Saves Money

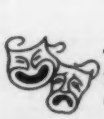
The higher voltage system provides greater capacity and flexibility than conventional systems. Yet it requires only half as many, or half as large, risers and feeders. Characteristics such as excessive voltage drop or costly power losses present no problems to this system. The use of lightweight aluminum bus bars makes the equipment easier to handle and easier to install.

More and more manufacturers of packaged electrical distribution systems are finding that Alcoa® Aluminum Bus Conductor offers advantages of lower cost, availability, design flexibility. Aluminum distribution bus weighs a third less than a copper system of equal conductivity. Pound for pound, it has greater current-carrying capacity than cable in conduit.

Alcoa Aluminum Is Your Best Bet, Too

Wherever your production requirements demand an efficient, flexible electrical distribution system, it will pay you to specify busways with Alcoa Aluminum Conductors. Write us for the names of manufacturers who specialize in this lighter, better, more economical product. Aluminum Company of America, 2301-D Alcoa Building, Pittsburgh 19, Pa.

Your Guide to the Best in Aluminum Value



THE ALCOA HOUR
TELEVISION'S FINEST LIVE DRAMA
ALTERNATE SUNDAY EVENINGS

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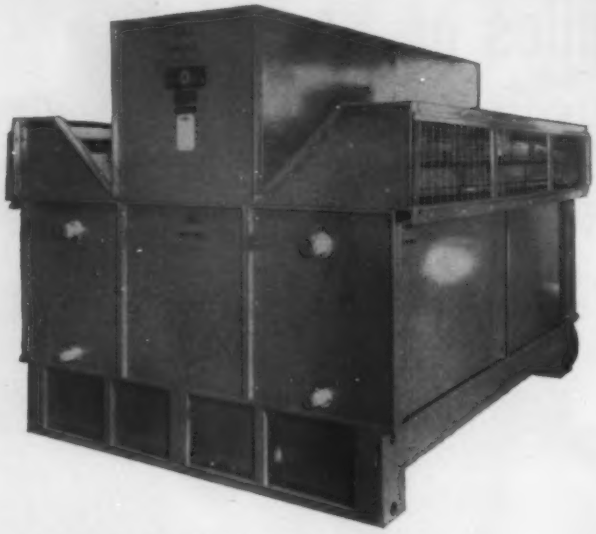


NIAGARA SECTIONAL
***Aero* HEAT EXCHANGER**
gives close temperature control, saves you ***LABOR,*** *Power, Water*

- **Because the new design improves the heat transfer to the out-door air by evaporation.**
- **Because new features keep your equipment working for long life with "new plant" efficiency...always full capacity.**
- **Because you save 95% of cooling water cost.**

You get faster, more accurate cooling of industrial fluids to specified temperatures.

You improve your quality of production by removing heat at the rate of input.

You save labor in upkeep. With full access to all interior parts and piping you see everything in easy inspections. You head off dirt accumulation and corrosion. Casing panels are removable without moving the coils. The coils can be cleaned from both sides.

First cost is low; freight is low because of the lowest space/weight ratio; you save much labor in erection. Capacity range is 7,000,000 to 18,000,000 Btu/hr. No other heat exchange method gives you so much saving in money and convenience.

Write for Niagara Bulletin 132. Ask for the full story of how you can save expense in your plant and improve your product's quality.

NIAGARA BLOWER COMPANY
Dept. PE, 405 Lexington Avenue
NEW YORK 17, N. Y.
District Engineers in Principal Cities

NIAGARA — *Over 40 Years' Service in Industrial Air Engineering*

For more facts circle 541 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 40)

pieces after buffing and before plating to eliminate the necessity of stripping the plate on parts which require rework.

6. Don't use just any compound. Employ the services of the many compound and buff sources available for proper kind to use.

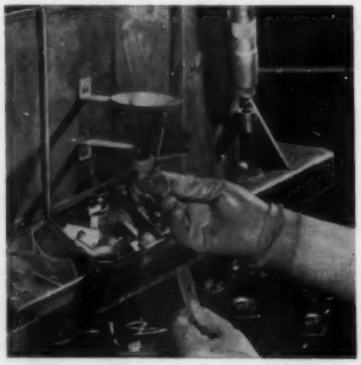
7. Avoid the use of heavier types of greases on belts to prevent belt loading.

8. Don't fail to use enough of the lighter (wet) type grease on belts. Otherwise, small drag marks will appear and show up in buffing before plating — particularly with zinc die castings. This fault is commonly blamed on the belt, but is really a fault of lubrication. Should the belt load up with grease as the result of over-lubrication to be on the safe side, the grease is easily removed with an oil now available in a pressurized can for this purpose. *From Grits and Grinds, published by the Norton Company, Worcester, Mass.*

Glue Applicator for Resin

IN THE ASSEMBLY of a steel stamping and fiber separator, it is necessary to coat one of the surfaces with a resin. Due to the size of the part and the nature of the resin, it was always painted on by hand. New methods of applying this resin were tried such as rollers, dipping, etc. but all failed.

The method which was finally used is the attachment of a glue applicator (the type is found in a five and ten cent store) to a funnel. By drawing the steel stamping across the applicator it is possible to get an even coating of resin without getting it on the operator's hands. *From a release of The Carborundum Company, Niagara Falls, New York.*



Funnel and glue applicator (arrow) are handy for coating surfaces with resin

STANOIL *Industrial Oil tough performer in delicate operation*

A. T. Wallace (right), President of Wallace Tool and Die Company, and Standard Oil lubrication specialist, H. A. Peterson, check sensitivity of new Cincinnati Hydro-Tel Milling Machine which uses STANOIL as hydraulic medium. Howard Peterson has been providing technical service to customers since joining Standard Oil. He is a graduate of General Motors Institute. Howard's customers find this experience pays off *for them.*

Delicate operations with metal requiring almost a surgeon's skill are every day stuff to Wallace Tool and Die Company, Indianapolis. Recently, they purchased a Cincinnati Hydro-Tel Milling Machine for their highest precision work. They selected STANOIL Industrial Oil for the hydraulic medium. The reason for choosing STANOIL: they wanted a hydraulic fluid that could deliver high performance. They wanted a clean hydraulic system, free of deposits that might clog filters and interrupt operations. They wanted smooth operation without pump chatter and without foam. They got these with STANOIL.

How did Wallace Tool and Die come to choose STANOIL? The answer is not hard to find. They had used STANOIL for hydraulic systems throughout their plant for many years. It has given them the results they wanted so it was natural to pick STANOIL for their new Cincinnati machine.

With STANOIL the machine performs the delicate operation of contour tracing with only 3½ ounces of pressure needed to control the milling cutters. STANOIL gives them smooth, steady, uninterrupted performance.

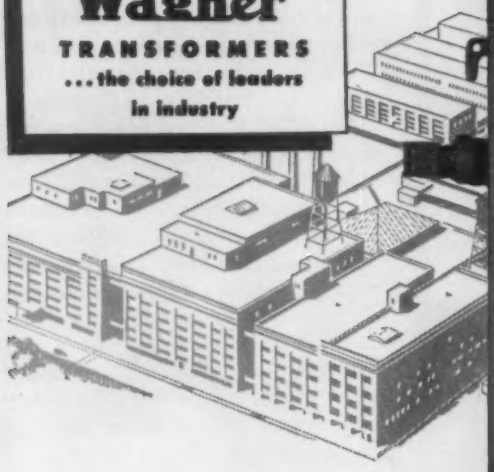
STANOIL can serve you. In the Midwest a lubrication specialist at your nearby Standard Oil office will be glad to show you. Call him. Or contact Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

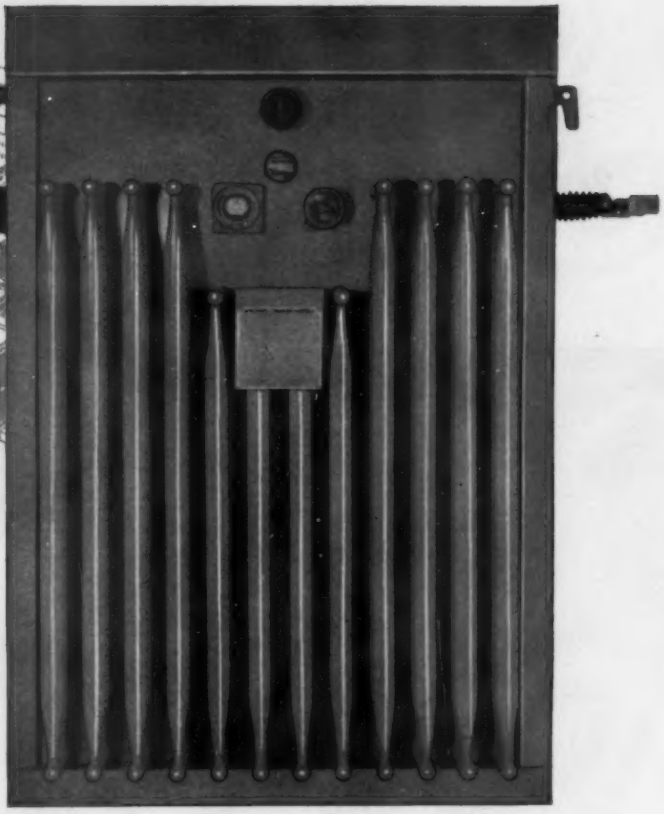
STANDARD

STANDARD OIL COMPANY (Indiana)

For more facts circle 542 on Reply Card

Wagner®
TRANSFORMERS
...the choice of leaders in industry





PLANNING A NEW LOAD CENTER?

...with the Wagner Close-Coupled Transformer, you can build a compact, modern unit substation

These Unit Substation Transformers save space... make a neat, streamlined installation

Wagner close-coupled, liquid-filled unit substation transformers can be easily flush-mounted with co-ordinated switchgear. And when they are, the result is a neat, modern, compact installation that not only saves space in your plant, but looks better too.

You get quicker delivery on a close-coupled Wagner transformer because there are fewer engineering difficulties than with the throat-connected type. It's not necessary to co-ordinate the bushing height of a close-coupled unit to match special switchgear. Bushing heights are designed to give ample room to make connection to switchgear or busses in the switchgear compartment or transition section. No need for special throats to match special switchgear.

Look to Wagner for transformers that assure a continuous dependable flow of power. Your nearby Wagner engineer will be glad to help you solve your load-center problems. Call the nearest of our 32 branch offices or write us.

Wagner Electric Corporation
6492 Plymouth Ave., St. Louis 14, Mo., U.S.A.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

T36-4

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

For more facts circle 543 on Reply Card

For more facts circle 544 on Reply Card——→

The "EXTRAS" are STANDARD on Bucyrus-Erie Transit Cranes

Any two carrier-mounted cranes look very much alike. You can tell the difference only by an extensive comparison of features. When such a comparison is made, Bucyrus-Erie Transit Cranes top the field because so many features that are "extras" at additional cost on other cranes are furnished as standard equipment on Bucyrus-Erie machines. Here's a rundown of such features and what they can mean to you on your material handling jobs.

Power controlled lowering for main hoist line on lifting crane permits delicate positioning of loads.

Friction swing brake, in addition to regular swing lock, permits more accurate spotting and holding of boom point over desired position.

Power controlled boom hoist, fully independent of all other functions, provides high accuracy boom control in crane work.

Safety boom stops, designed to prevent boom from accidentally snapping over center and striking cab, are furnished on all machines equipped for lifting crane service.

Pendant-type boom suspension with 8 parts of operating line between bridle and boom point is ideal for changing boom lengths conveniently.

Open-throat boom design permits easy rigging of multi-part lines.

Extendible outriggers, two on each side of carrier chassis, provide added stability for swinging capacity loads.

Transit Cranes are offered in two sizes — the 15-ton Model 15-B and 25-ton Model 22-B. See your nearby Bucyrus-Erie distributor for full information on the size machine you need.

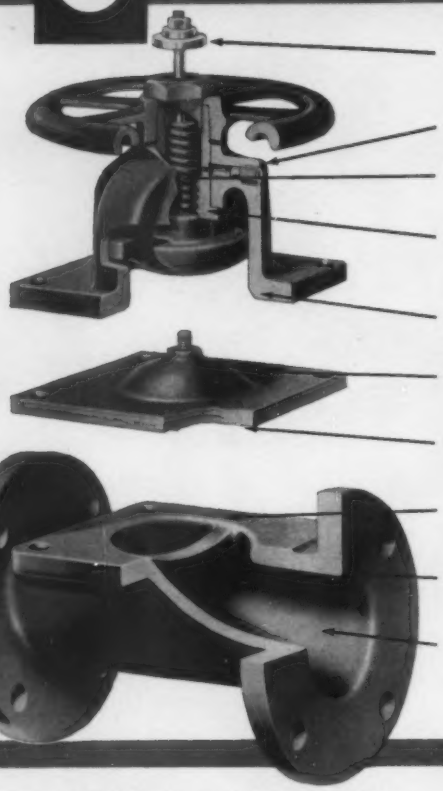
124E55C

BUCYRUS-ERIE COMPANY

SOUTH MILWAUKEE, WISCONSIN

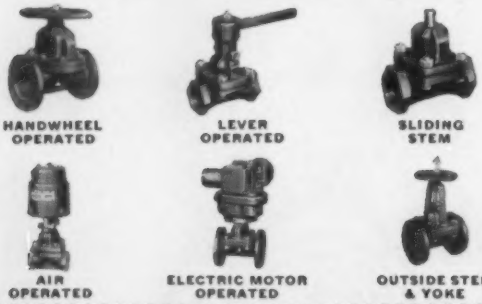
WITH ONLY **3** **SIMPLE COMPONENTS**

Hills-McCanna Diaphragm Valves offer all these outstanding features for handling corrosives



1. **TELL-TALE TRAVEL STOP** shows position of diaphragm; prevents possible damage to diaphragm that could result from overclosure.
2. **CHOICE OF 36 BONNET ASSEMBLIES** assures a means of operation best suited to your requirements.
3. **SUPERIOR MECHANICAL DESIGN** transmits closing force to the compressor through a long, full-threaded special bronze sleeve.
4. **WORKING PARTS ISOLATED FROM FLOW** by means of the diaphragm. Similarly, the fluid handled is not contaminated by bonnet lubrication, products of decomposition or atmospheric contamination.
5. **NO PACKING** to be replaced. The diaphragm effectively seals the bonnet assembly from the flow.
6. **TOUGH, RESILIENT, REINFORCED DIAPHRAGM** in a choice of 14 materials permits handling of over 1000 industrial chemicals.
7. **POSITIVE, LEAK TIGHT CLOSURE** is assured by sealing beads on diaphragm and cushioned pressure seating of the diaphragm against the weir.
8. **SIMPLE MAINTENANCE** is limited to occasional diaphragm replacement which can be done without removing valve body from line.
9. **CHOICE OF BODIES** is very wide, including any machinable alloy, molded plastics or linings of rubber, glass, lead or plastic.
10. **SELF-CLEANSING** characteristic is made possible by absence of pockets, corners, grooves and sharp changes in direction.

A COMPLETE CHOICE OF METHODS OF OPERATION TO SUIT YOUR REQUIREMENTS



• Hills-McCanna diaphragm valves are offered in sizes from ⅜" through 14". Dependent on size and type of body and diaphragm materials, they will handle pressures to 150 psi, temperatures to 350° F. For specific recommendations, send an outline of your corrosion resistant valving problem. To have full data at hand, ask for the Hills-McCanna valve catalog.

HILLS-McCANNA CO.

2450 W. Nelson St. Chicago 18, Illinois

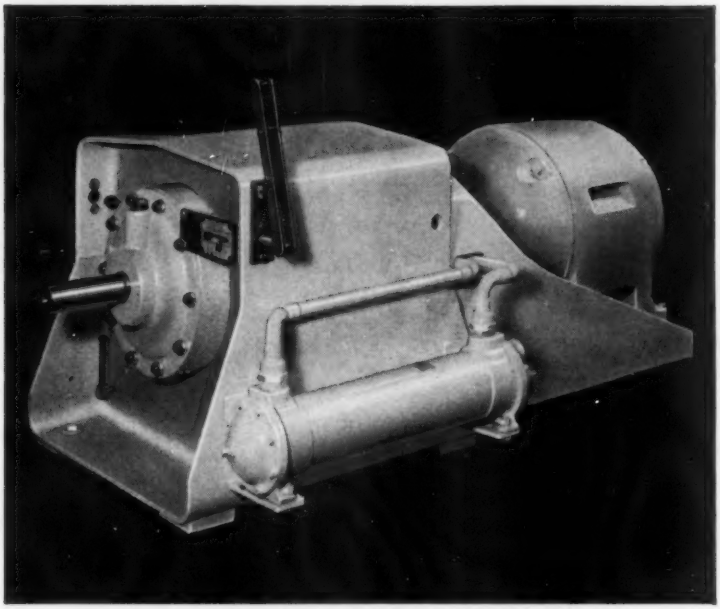
Manufacturers of: Saunders Patent Diaphragm Valves • Chemical Metering and Proportioning Pumps • Force Feed Lubricators • Light Alloy Castings

HILLS-McCANNA...

Corrosion Specialists Since 1870

For more facts circle 545 on Reply Card

Gýrol Fluid Drives limit torque to give you a built-in safety factor!



Type VS, Class 2 Gýrol Fluid Drive is available in ten sizes, 1 hp to 800 hp, speeds to 3600 rpm.

The American Blower Type VS, Class 2 Gýrol Fluid Drive not only offers adjustable, stepless speed control, but its inherent shock - absorption ability protects machinery.

For, a Gýrol Fluid Drive will limit the amount of torque which can be transmitted under overload conditions. This torque-limiting capacity can be adjusted by merely positioning the speed-control lever.

What's more, Fluid Drive permits the motor to come up to speed under almost no-load conditions—allowing simplification of motors and starting equipment for heavy starting loads.

You'll discover many more important benefits for a wide variety of industrial applications by calling our nearest branch.

FEATURES

- Can be reversed while in motion by reversing motor
- Across-the-line starting on many applications
- Motor can reach full speed before engaging load
- A compact, self-contained unit
- Trigger-action response — adjustable speed
- Speed may be controlled manually or automatically

Speed control for the paper and textile industries

Papermaking and processing machinery needs smooth starting to prevent tearing; adjustable speed to adjust machinery to humidity, paper thickness; no-load starting to keep power requirements down. Fluid Drive is the practical answer. It meets these problems easily – and without excessive maintenance. In the same manner, textile machinery needs accurate speed control to give maximum production rates within safe limits for the yarn. Again the answer is Gýrol Fluid Drive. Consult our nearest branch office or write us for information.

American Blower products serve industry

- AIR CONDITIONING, HEATING, VENTILATING EQUIPMENT
- MECHANICAL DRAFT EQUIPMENT
- INDUSTRIAL FANS AND BLOWERS
- CENTRIFUGAL COMPRESSORS
- GÝROL FLUID DRIVES
- DUST COLLECTORS
- REFRIGERATING MACHINES

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of AMERICAN-Standard

AMERICAN 75th ANNIVERSARY YEAR **BLOWER**

For more facts circle 546 on Reply Card

For more facts circle 547 on Reply Card →

WHY PAY FOR TWO WHEN ONE WILL DO?

Fist test helps you to see why Scott Towels cut towel consumption

Try this: Put your fist into a Scott Towel, see how it stretches and conforms to your hand—how the drying surface instantly comes into play. This makes for thorough drying. Result: one Scott Towel is used instead of two or more.

ONE SCOTT TOWEL DRIES BOTH HANDS!

Photo: Gjon Mili

It's this simple: If towel consumption is high in your washrooms, your towel costs are high. If consumption is low, your towel costs are down-to-earth. *Don't ever confuse initial price per case with economy.*

The Scott Towel has the qualities needed to keep consumption low—softness, stretch and high absorbency. One Scott Towel dries both hands quickly and comfortably. There's no extra consumption, no extra washroom maintenance—cost is at a minimum.

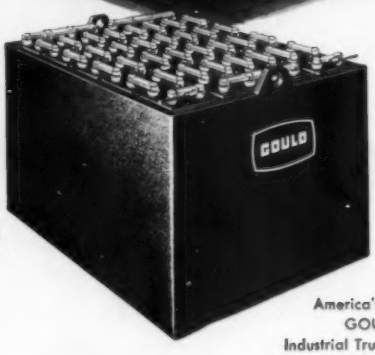
Scott's the brand of towel your people buy for home more often than any other brand.

Give your local Scott representative or distributor a call today. Let him show you how you can determine the cost-reducing possibilities of Scott Towels in your washrooms.

Another quality product of

SCOTT PAPER COMPANY

"You Get Extra Battery Performance -



America's Finest!
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Industrial Truck Batteries

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PUBLIC AUDITORIUM
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1956
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EXHIBITOR
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THANKS TO GOULD FIELD ENGINEERING SERVICE!"

It's a proven fact that regular, systematic battery care can add months, perhaps years, to the life of a battery! Gould's nation-wide Field Engineering Service enables *you* to get the benefit of this added service . . . and lower your over-all battery power costs.

Your Gould Field Engineer's one job is to see that you get maximum service from your batteries. He is factory-trained to instruct your own men as to correct maintenance routines and to help set up a simple record system for anticipating battery needs.

There's a Gould Field Engineer in your area. He's as near to you as your telephone. Call him. And when you see him, ask him for the new Gould Plus-Performance Plan material for your battery maintenance staff.

Always Use Gould-National Automobile and Truck Batteries

GOULD
Batteries

GOULD-NATIONAL BATTERIES, INC.
TRENTON 7, N. J.

"BETTER BATTERIES THROUGH RESEARCH"

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Hall Industrial Water Report

VOLUME 4 APRIL 1956 NUMBER 2

Corrosion—a Plague on All Our Houses

—presents problems as varied as industry, for all industry uses water in some way and all water causes corrosion to some extent. Thirty years of experience in thousands of individual plants enables Hall Laboratories to apply to current problems the most practical techniques for control of corrosion, many of them developed by Hall research and engineering.

Condensate System Saved

On his first visit to a new client, a hospital in Virginia, Hall engineer C. F. Raines encountered corrosion of the black iron condensate system so "terrible" that two men were kept constantly busy just replacing fittings and piping.

Both pitting and etching of the steel were occurring, suggesting that both dissolved oxygen and carbon dioxide were factors in the corrosion. However, the oxygen was not readily accounted for.

Raines examined the feedwater heater and found there was no way for the steam from the deaerating section to pass to the vent condenser. A tee had been installed in the line to take care of this, but instead had been used for a condensate line from the laundry. By proper rearrangement of connections, adequate venting was obtained as had originally been intended.

Additional changes included feeding 1 ppm. of Hagafilm® to the boilers to inhibit return line corrosion, and Santosite to react with residual oxygen not removed in the feedwater heater. Condensate line corrosion became negligible. Instead of replacing the entire condensate system at a cost of several thousand dollars, the plant now protects the system chemically at a cost of 17 cents a day.

Gasket "Corrosion" Problem Quickly Solved

Attack of boiler handhole gaskets at the pressure points of the locking clamps—center top and center bottom—on the sealing surfaces was experienced at a plant in West Virginia serviced by Hall engineer Wm. J. Reese.

At first it was thought that a highly-concentrated solution of caustic had dissolved the asbestos packing.

This possibility was rejected when it was concluded, after careful examination, that the gaskets had been distorted due to excessive pressure applied to the extremities of the minor axis in order to prevent leakage at the ends of the major axes. Subsequent investigation revealed the machined surfaces of the seats did not overlap properly at the ends of the minor axes, and the high points coincided with the areas of attack on the damaged gaskets. Refinishing the gasket seats eliminated the problem.

Bacterial Growths Get the Air

Severe corrosion under rusty deposits in an ammonia condenser prompted a food processing plant in Ohio to call on Hall Laboratories for help. Suspecting iron-fixing bacteria to be responsible for the hydrous ferric oxide deposits, Sales Engineer J. M. Harvey sent samples of water and a sample of wet deposit to Pittsburgh for investigation.

Bacteriological examination showed both iron-fixing and sulphur bacteria in the well water. Chemical examination showed the water to be high in bicarbonate hardness, with approximately 2 ppm. of iron and manganese in solution. Chlorination of the water was needed to kill the living organisms, but this would oxidize the iron and manganese and cause them to deposit, even though the iron-fixing bacteria which had been causing this were eliminated. Harvey met this dilemma by recommending stabilization of the calcium carbonate, iron, and manganese by continuous feed of threshold amounts of Calgon directly to the bottom of the well, followed by intermittent addition of hypochlorite to the discharge side of the well pump.

But this plant had everything. Now a different problem developed with an accumulation of slime in the condensers. In a new sample of wet deposit, Hall Laboratories found sulfate-reducing bacteria. Since these peculiar "bugs" thrive only in the absence of oxygen, continuous aeration of the well water was recommended to supplement the intermittent chlorination.

Operating experience has proved that aeration has been decidedly beneficial. There have been no condenser outages for cleaning, whereas formerly cleaning was necessary several times each summer.

These Whistles a Bargain, Sir!

In a Michigan plant the original soot blowing system lacked the whistles normally installed. When the steam valve was shut off after soot blowing, the vacuum produced drew gases from the ash pit through the drain into the piping. Severe corrosion resulted. Correction involved installation of the whistles to prevent vacuum by acting as vents.

Ben Franklin's advice to consider alternatives before buying a whistle lest disappointment prove payment too dear for the choice could thus be answered, "*These* whistles were a bargain, Mr. Franklin."

Industrial Water Problems Require Special Handling

There are no "stock answers" to industrial water problems. For information write, wire or call Hall Laboratories, Inc., Hagan Building, Pittsburgh 30, Pa.

Water is your industry's most important raw material. Use it wisely.

OPERATION AND PRODUCTION pointers for the industrial plant engineer

Edited by H. E. B. Anderson

Card Keeps Tabs on Production

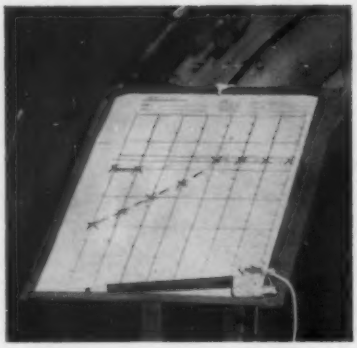
GRAPHIC RECORDING of hourly work progress is currently meeting with favorable results on a production line for guided missile storage containers at the San Jose, Cal., plant of John Bean Div. of Food Machinery and Chemical Corp.

On a simple graph, up-to-the-hour record of the completed number of work units is maintained. By plotting his progress curve, the worker knows at all times how his production compares with the standard rate for the particular job, the standard rate being indicated by a horizontal line on the graph.

The worker's production curve is generated by him as he marks his production rate at the appropriate level. At the end of each hour, a line is then drawn from point to point to complete the curve.

This curve joining the points shows increases or decreases in production rate as they occur. With this measure of his efficiency before him, the worker can apply his skills and time more effectively.

A declining curve immediately tells both the operator and his supervisor that something is wrong, and requires attention. If the operator is at fault, additional training or work load balancing can be undertaken—and if the loss in production is accountable to machine failure, it is readily evident. Such failure is noted on the reverse of the production chart, giving a permanent maintenance record for future reference.



Mounted on a sheet metal "desk" chart is handy for production tally

The chart, which can be made to fit all conditions, is constructed to cover two eight-hour shifts starting at 7 AM and 4 PM. Contrasting colored curves are used for each shift, setting up a competitive spirit when the same chart is used for two shifts. Under normal conditions, the curve would tend to be flat, since it would then coincide with the standard rate line.

Copies of hourly progress charts should be kept conspicuously posted at the work station so that performance of the machine or person can be readily observed on a day-to-day basis as well as on an hour-to-hour basis.

Tire Balancing — On Air

BALANCING automotive wheels and tire assemblies at the Oldsmobile Division of General Motors is done on a film of air, with a machine developed by GM's Research Staff.

The machine uses an air-ball pivot approximately an inch and a half in diameter to register both the amount and location of unbalance on wheel and tire assemblies. Each assembly is balanced on a film of air 0.002 in. thick.

The semi-automatic balancing operation follows this sequence:

Wheels with tires inflated move horizontally along a conveyor to an elevator, which lowers the wheels in pairs onto air-ball pivots. Sixty pounds of air pressure, flowing through the pivot stems, lift the wheel on a cushion of air.

When poised on the air-ball pivot, the wheel and tire tilts toward its heavy or unbalance point, similar in action to a small disc balanced on a pencil tip.

(Continued on page 62)

Use of Combination Insulating and Finishing Cement Speeds Insulating Job

AN IMPORTANT phase of maintenance on petroleum processing equipment is the replacement of thermal insulation on lines and vessels. Insulation removed to give access for inspection, cleaning or repair must quickly and economically be replaced if shutdown costs are to be held to a minimum.

At the Bayway Refinery of the Esso Standard Oil Co., Linden, N. J., two permanent insulation crews, which work continuously in conjunction with other maintenance personnel, have standardized materials and procedures for maximum efficiency. During the several weeks that a catalytic cracker unit may be down for routine maintenance, the insulation crews work around the clock to insure prompt completion of their job.

Fig. 1. Double layer of blocks are set in place against exposed reactor shell

Fig. 2. Application of insulating-finishing cement provides exterior insulation

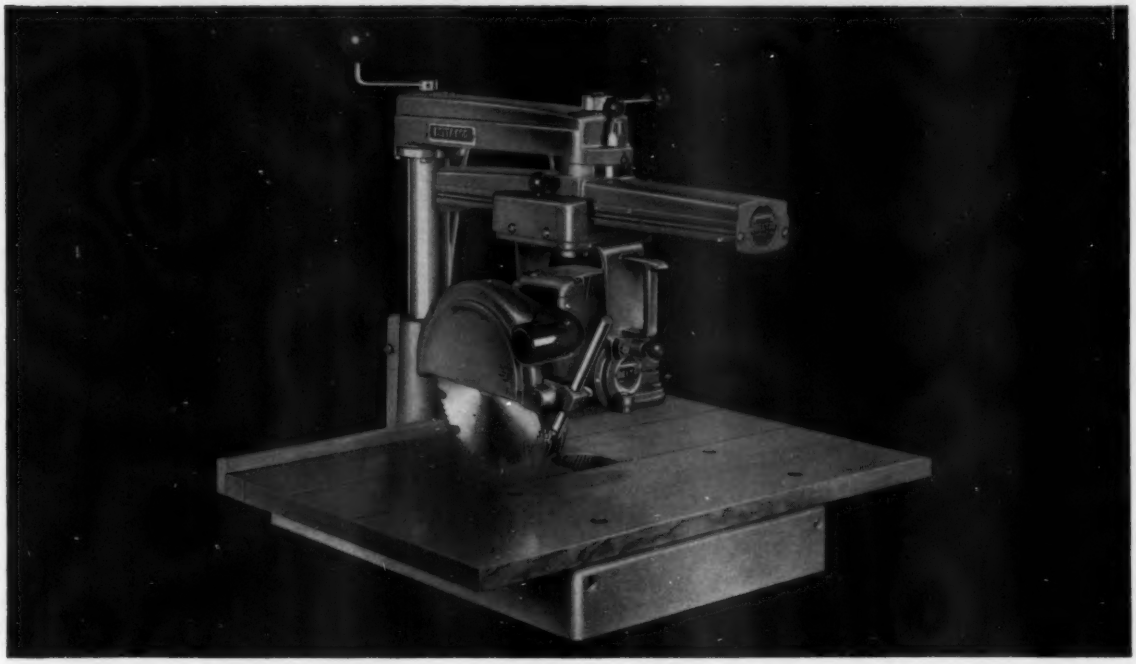
Selection of insulating materials contributes to the efficiency of the reinsulation. Mono-Block, manufactured by Baldwin-Hill Co., Trenton, N. J., is used on high temperature lines of 14-in. diameter or larger, and on large vessels.

On the catalytic cracker, two layers of blocks were positioned against the wall of the vessel, and secured by horizontal tie wires which stretch between rods previously welded several inches from the surface of the reactor.

Insulating-finishing Super Powerhouse cement, is applied over the blocks and permits installation of insulation without the use of wire mesh to hold the outer finish in place.

NEW ROCKWELL-BUILT DELTA "900"

finest 9" radial saw ever built



Delta now adds to its great radial saw line the most powerful, most useful, 9" radial saw ever built for plant maintenance and crating work. That's because you get all these Delta "big saw" *features at* "small saw" *cost!*

EXCLUSIVE "TURRET ARM" ACTION—The *only* 9" saw with the double over arm construction preferred in big saws. Pivot point *always* stays over the center of the table for greater capacity, versatility, accuracy and safety.

TRUE ¾ HP MOTOR—Guaranteed for one full year! Most powerful on *any* 9" radial saw—you make heavy cuts faster, easier.

SELECT EDGE GRAIN FIR TABLE—Only the *finest* grade wood is used to guarantee freedom from warpage or distortion.

EXCLUSIVE "WIDE BEARING" CONSTRUCTION—Carriage rolls on wide spaced bearings for greater rigidity, years of accurate service with low maintenance.

See the great new Delta "900" Radial Saw—compare it with any other 9" radial saw on the market! Then make up your own mind! Your Delta Dealer is listed under "TOOLS" in the classified pages of your phone book.

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Another Product by **Rockwell**

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☐ Please send catalog on new Delta "900" Radial Saw.
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OPERATION—PRODUCTION

(O and P begins on page 60)

Wheel assemblies, balanced by air-ball pivot, move past operator for weighting

As the wheel and tire tilt, an electronic computer registers both the amount and location of the unbalance. Next, an automatic marker stamps the amount of unbalance in ounces on the inside of the wheel rim, directly opposite the heavy side of the wheel. As the wheels move along the conveyor, the operator checks the number of ounces of unbalance and attaches a weight to the rim opposite the heavy side, to compensate for the unbalance, and the wheel is ready for the assembly line.

The marker stamps an "x" on the inside of the wheel rim of an assembly that is extremely unbalanced, identifying it as a reject. It is taken out of production immediately.

Filter Clears Edible Oils

REDUCTION of maintenance costs and improvement of the filtered quality of coconut oil have been the results experienced by the National Biscuit Co., since their adoption of a Delpark paper filter for filtration of edible oils. In one instance, the filter is being used on the coconut oil used in processing Nabisco Wafer Crackers.

The coconut oil is sprayed on crackers as they leave the oven. Electrically heated in the filter tank to a temperature between 110 F and 130 F, the oil is sprayed on the crackers in a fine mist. The resulting overspray carries particles of salt and crumbs into the oil system, and if these particles are not removed, they eventually cause clogging and inefficient operation of the spray nozzles.

With the screens formerly used to remove these salt and crumb particles, the average time required for cleaning the screen, after 24 hours use, was about 90 minutes. Now, with the continuous filter in operation, the spray nozzles stay foul-free, salt and crumb particles are removed from the oil continuously and filter material is automatically renewed as necessary.

The filter material rests on and conforms to, a flat endless conveyor of open mesh construction. The sloping sides form a shallow pool of the conveyor and an inclined ramp provides for removal of filtered solids.

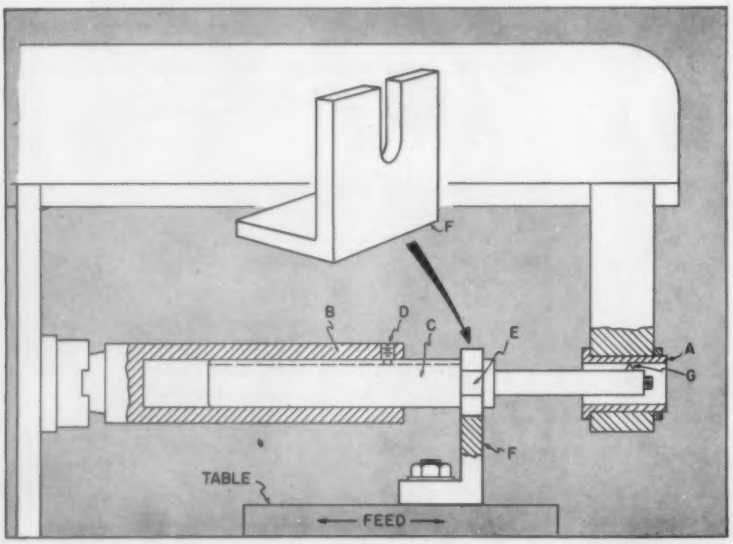
Crumb-bearing oil is fed onto the filter material, the oils filter through by gravity, and the solids remain on the surface of the filter to form an efficient filter bed. When the flow through the filter is reduced by the solids held on it, the liquid level rises. This action raises the float which actuates the switch causing the con-

(Continued on page 64)

In-Place Boring of Overarm Bushing Improves Milling Machine Accuracy

AS A FINAL assembly operation, at least one milling machine manufacturer bores out the mandrel support bushing in place on the machine, to insure that when mounted in the machine and supported by the overarm bracket, the mandrel will have its axis parallel to the table. A similar procedure should be followed when reconditioning a milling machine, or when installing a new bushing in the overarm bracket.

One setup for boring out a bushing, A, is shown in drawing. Mounted in the milling spindle nose taper is a hollow boring bar sleeve, B, which is held in place by a draw-bolt running through the hollow spindle. The sleeve is made from bar stock.



Cross section of setup for boring out bushing. Bracket F is shown in detail

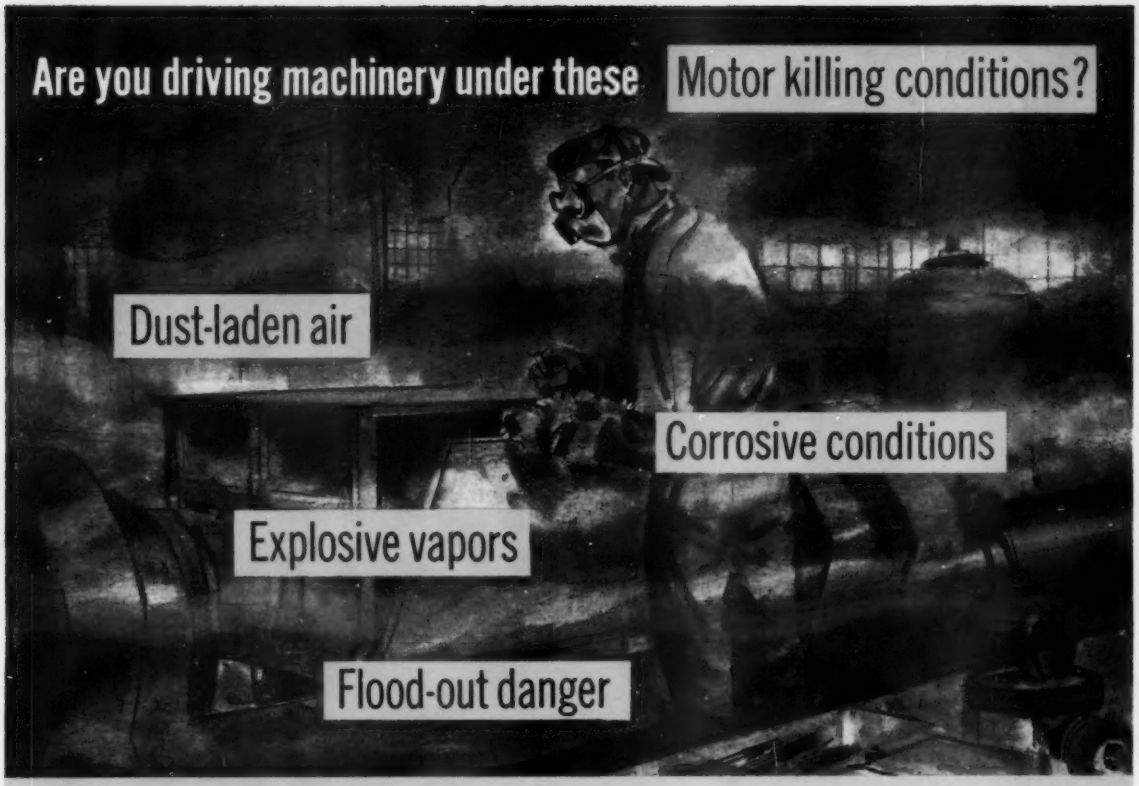
Into the bore of this sleeve, boring bar C is slid, with clearance between it and the sleeve at a minimum consistent with smooth working. The sleeve and bar are fastened together by pin D, engaged in a keyway running longitudinally along boring bar.

Machined integrally with the bar, groove E forms a pair of faces for engagement with the faces of traverse bracket F. The shape of this bracket is shown in the isometric detail.

The bracket is bolted to the machine table, and the table feed is used to traverse boring tool G through the bushing. As the table travels horizontally, the bracket sides push or pull on the boring bar groove, so that the tool is fed progressively through the bushing, boring it out in line with the table.

With the boring bar arrangement described, not more than 0.01 in. of metal should be left for removal by the boring tool. On a reasonable good milling machine, the bore should not be more than a few thousandths out of line with the spindle axis or the table top. The final boring will remove these slight inaccuracies from a bushing that has been machined in a lathe.

It may be necessary to run the boring tool through the bushing several times, to compensate for the spring effect in the slender boring tool bar.



This New BJ Mechanical Drive Motor solves these problems!

Where difficult operating conditions make the use of a conventional open-wound motor either extremely impractical or hazardous, your best answer is the BJ Mechanical Drive Motor. Designed for the most rigorous use, this totally enclosed motor is filled with oil and mechanically sealed to make it impervious to *any* external condition. There is no possibility of sparking, corrosive attack, flooding out or "loading up." If you are driving machinery in mining, milling, refining or other industrial applications where these "motor killing" conditions exist you owe it to yourself to investigate the BJ Mechanical Drive Motor. It is a proven product of Byron Jackson's more than 20 years experience in the design and manufacture of oil-filled, sealed electric motors.

The BJ Mechanical Drive Motor is available in sizes from 5 to 450 HP, 4 pole, and can be supplied to meet the special torque or horsepower and speed requirements of any particular application. *Write for special BJ Mechanical Drive Motor information.*

BJ

Byron Jackson

Division of Borg-Warner Corporation

P. O. Box 2017A, Terminal Annex

Los Angeles 54, California

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"I'm glad we use CHAMPION Lamps around here. With the service we're getting out of 'em they're the best buy in Lamps."

CHAMPION LAMP WORKS
Lynn, Massachusetts
A DIVISION OF CONSOLIDATED ELECTRIC LAMP CO.

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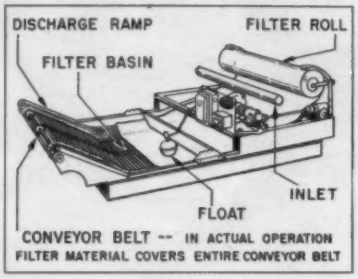
OPERATION—PRODUCTION

(O and P begins on page 60)

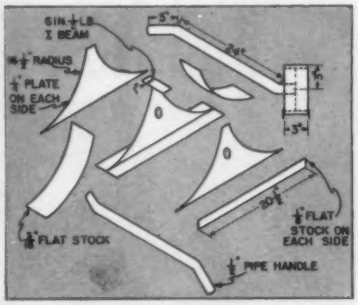


Cutaway sketch shows typical filter as used by Nabisco to filter coconut oil

veyor to carry the filter material forward and bring clean filter cloth under the dirty oil inlet. As the oil filters through the clean filter cloth, the level (and the float) drops, and the conveyor stops until solid build-up on the filter prevents rapid filtration. Then, the cycle is repeated.

Welded Construction Lightens Wheel Block for Railroad Cars

Contributed by G. F. Suchy



Exploded view of railroad wheel car block shows component parts. Cross section, upper right, shows parts as assembled in all-welded construction. Total weight of block is only 19 lb, which compares with usual 30-40 lb weight of similar cast wheel blocks

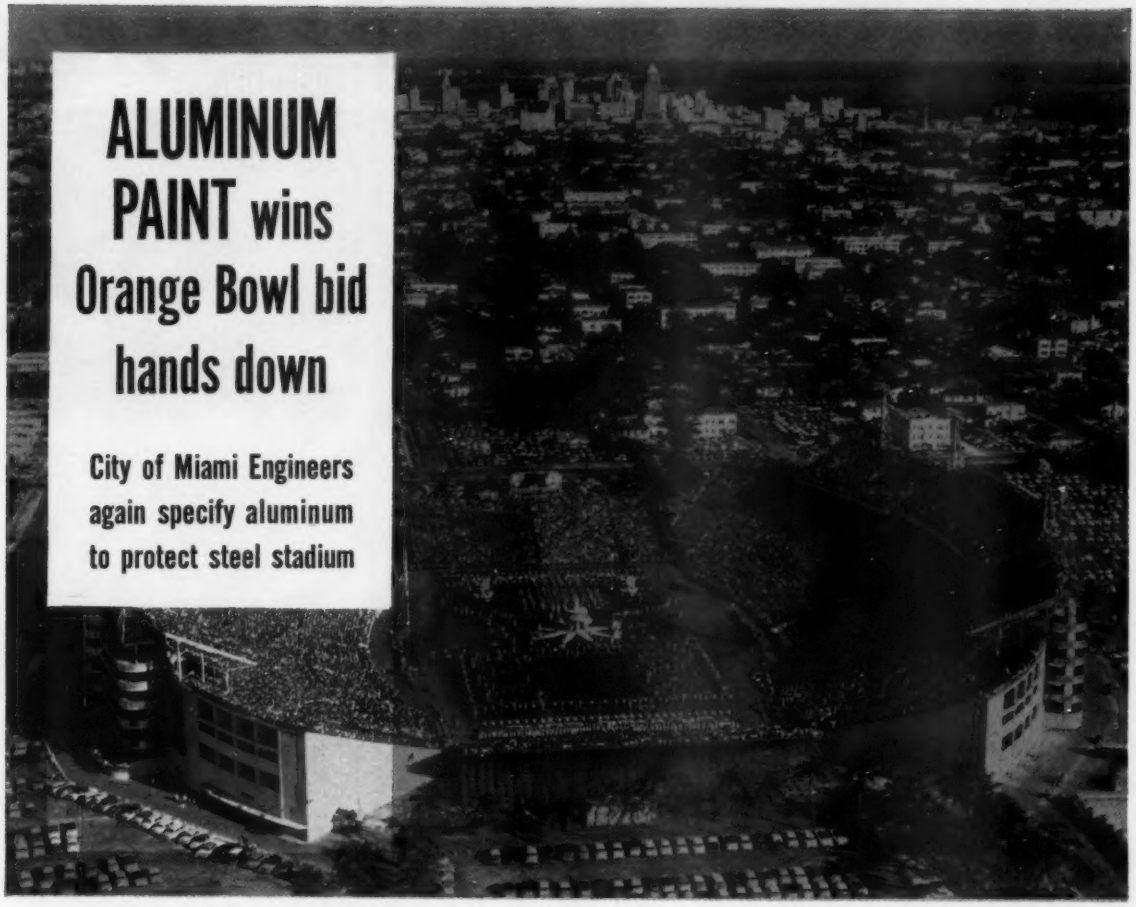
Tanker Rolls to the Job

SHAPED LIKE a watermelon, a rubber tank has been developed by the Aviation Products Div. of Goodyear Tire & Rubber Co., for the bulk transportation and storage of fuels and other liquids.

Called the Rolli-Tanker, the container can be rolled over ground, floated in water and dropped without bursting. The tanks are unconventionally-shaped tires of nylon cord and tread stock construction with fuel-proof lining. Although they can be built in

ALUMINUM PAINT wins Orange Bowl bid hands down

City of Miami Engineers again specify aluminum to protect steel stadium



The world-famous Orange Bowl at Miami, Florida, was recently enlarged for the fourth time. Aluminum Paint as manufactured by **Gable Tite Products Company, Inc.**, Miami, and applied by V. J. Hoecherl Painting Co., contractor, was used for the new addition.

It takes a star performer with a proven record to be invited to the Orange Bowl. But here's a *real* performance and a *real* record. Aluminum paint has been "invited back" *every season* for many years. The Department of Engineering of the City of Miami specifies aluminum paint because:

"When properly applied, aluminum paint offers excellent protection against the atmospheric conditions found in South Florida. For this reason aluminum paint was specified for the finish coating of all steel members in the 4th addition of the Orange Bowl Stadium. Aluminum paint has been used on the Orange Bowl for many years."

Aluminum paint's outstanding record on the Orange Bowl should suggest some applications in *your* business . . . point the way to painting economies you should be making. A paint that can withstand the salty, moist sea air and the blazing sun of Florida—and look beautiful along with it—could be just the paint for your plant.

ALCOA does not make paint . . . but ALCOA Aluminum Pigments are used in more aluminum paints than any other brand. ALCOA's cooperation with paint manufacturers has made possible many special formulas designed to solve your toughest problems. Aluminum paint offers the utmost in brightness and protection.

Write today for more information on all types of aluminum paints. Use the coupon.

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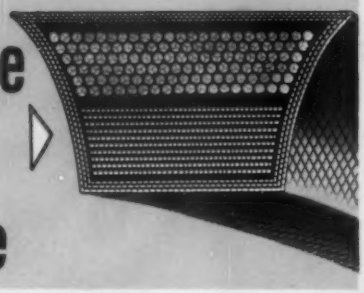
Why this curve lengthens V-belt life



THE CONCAVE SIDES (U.S. Patent 1813698) of every Gates V-Belt are a precisely engineered curve. This curve greatly lengthens V-belt life for this interesting reason:

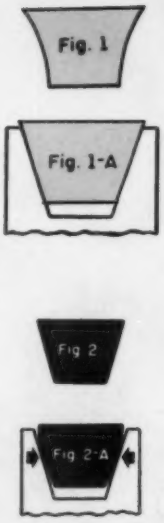
When you bend a Gates V-Belt, just as it is bent around a sheave, the concave sides (Fig. 1) become straight. Therefore, the belt makes full contact with the sheave, gripping the sides evenly (Fig. 1-A) and wear is distributed uniformly across the sidewalls of the belt. Naturally, uniform wear lengthens belt life; saves on replacement costs and cuts down-time.

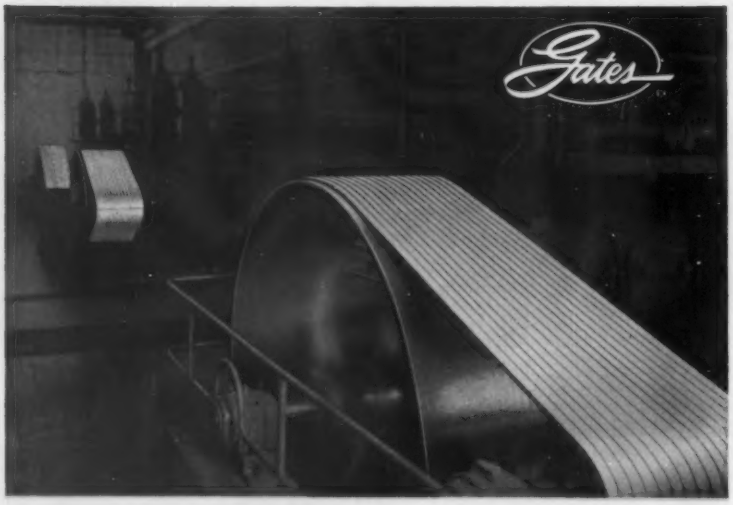
Now see what happens when you bend a straight-sided belt. (Fig. 2) Just feel the sidewalls *bulge out* at the bend. The bulge causes *uneven* contact with the pulley, as in Fig. 2-A. And uneven contact causes excessive wear at points shown by arrows; belt life is shortened.

Cut costs by getting longer wear from your V-belt drives. Specify Gates Vulco Rope—the V-belt with concave sides. Your nearby Gates distributor will supply your needs promptly. The Gates Rubber Co.—*World's Largest Maker of V-belts.*

There are Gates Engineering Offices and Distributor Stocks in all industrial centers of the United States and Canada, and in 70 other countries throughout the world.

TPA-74



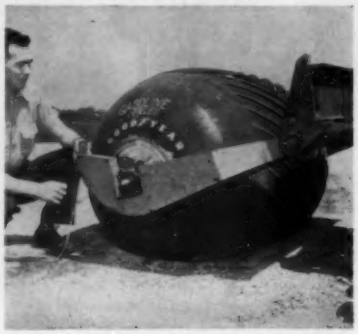


Gates Vulco Rope Drives

For more facts circle 554 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 60)



Mounted behind a light truck for towing, Rolli-Tanker is ready for test run

a range of sizes, tests to date have been on 3½ ft by 5 ft tanks, weighing 40 lb deflated and capable of carrying 250 gallons of liquid.

Mounted on hubs and axles to permit easy handling, the tankers may be towed manually or by a vehicle. Only 30 lb of drawbar pull—easily supplied by one man—are needed to roll the storage units, when loaded.

Filled tankers can be towed singly or in tandem, and low footprint pressures permit drawing them over unprepared surfaces such as rocky uneven terrain, swampy soil and sandy areas.

Transistors Trace Trouble

TRANSISTOR RADIOS can trace down trouble in electrical equipment, and the Raytheon T-500 all-transistor portable radio has proved to be an excellent trouble-shooter in this type of detection.

According to Raytheon personnel, the voltage regulation department of the Toledo Edison Co., Toledo, Ohio, has reported the radio as being extremely helpful in locating poor connections in power receptacles, defective fluorescent and incandescent bulbs and fixtures, as well as other sources of radio and television interference.

The power company had used standard portable radios and portable direction finding devices in a similar application, but heaviness, bulkiness and short battery life had shown them not too satisfactory.

The T-500, which operates 500 hours on the current from four standard flashlight batteries, weighs only five pounds with batteries. Its rigid handle design proves valuable in the trouble-hunting chore, and its hardwood cabinet is durable and rugged.

Trouble-shooters can find troubles

MICRO precision switches

...THEIR USE IS A PRINCIPLE OF GOOD DESIGN

MICRO SWITCH Trip Control installation. Each operator must operate two switches before press will work

MICRO SWITCH Trip Control speeds production, provides safety to operator and equipment

Whether a press is operated by one, two, three or four or more operators, MICRO SWITCH Trip Controls make sure it cannot operate until every man is at his safety station.

Increased production comes from:

- Instant electrical response
- Feather-touch operation
- Easy control changes
- Decreased operator fatigue

Increased safety comes from:

- Two-hand operation
- Cannot be "cheated"
- Inoperable if any component fails
- Interlock prevents power stroke while changing dies.

New machines may be made safer and more versatile by the use of MICRO SWITCH Trip Controls. Old equipment may be electrified and modernized to bring productivity up to today's requirements.

A Trip Control installation consists of only one compact control box, two hand switches per operator, one foot switch per operator (if desired), lock-out switches (if desired) and clutch-actuating equipment if machine is not power-clutch actuated.

Hand switches have snap-action contacts, which require only short, easy actuation. Both must be operated within a set time interval. The compact control box is easy to mount. A lock on the cover permits only authorized personnel to make control changes. A hinged, dead-front panel inside isolates all current-carrying components.

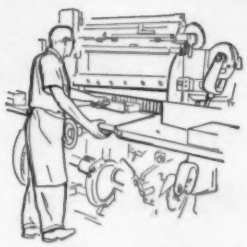
MICRO SWITCH Trip Controls have wide range of uses

These controls offer a choice of desirable single-stroke control for positive mechanical clutch machines and automatic cycling control for friction clutches and hydraulic and pneumatic equipment.

FOR SMALL PRESSES

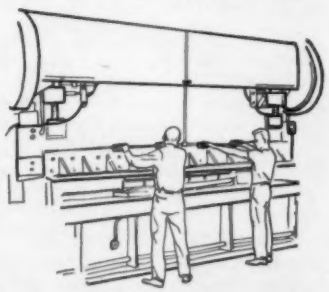
Provides fast, safe, effortless operation of small two-hand presses, riveting machines, etc.

ONE HAND—IF NECESSARY



Where one hand is required to hold stock in a protected or enclosed die, control is quickly converted to one-hand operation.

FOR USE ON LARGE PRESSES



Makes operation of large presses safe and less tiring. Any number of operator stations may be "wired into" the control circuit.

SEND FOR CATALOG 65 TODAY

Gives complete description of all controls and clutch actuating equipment.

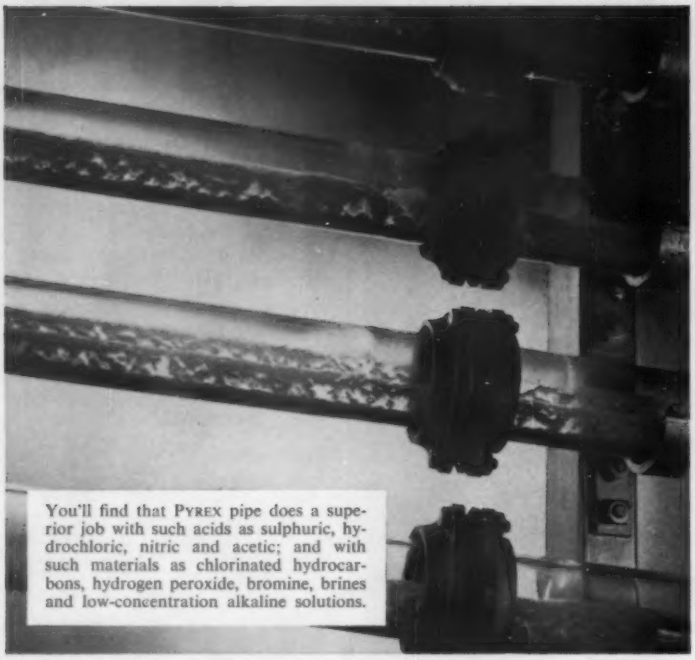
Let us send you complete information on MICRO SWITCH *Trip Control and the name of the distributor nearest you.*

MICRO SWITCH

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

In Canada, Leaside, Toronto 17, Ontario • FREEPORT, ILLINOIS

For more facts circle 555 on Reply Card


You'll find that PYREX pipe does a superior job with such acids as sulphuric, hydrochloric, nitric and acetic; and with such materials as chlorinated hydrocarbons, hydrogen peroxide, bromine, brines and low-concentration alkaline solutions.

Are you missing the corrosion resistance of PYREX® pipe because you think it will break?

One plant manager describes his experience with PYREX pipe this way: "There was no breakage during installation. There have been no lines broken because of the product handled, the temperatures involved, or the age of the pipe. There has been no accidental breakage. In short—there has been *no breakage.*"

Every acid-handling line in this manager's plant has been PYREX pipe since 1943. The company switched to PYREX pipe because acid products quickly corroded metal lines.

Corrosion in the metal lines also made cleaning difficult. Frequent replacements made maintenance very costly.

Engineers and operating men in hundreds of processing plants make similar "no breakage" reports about millions of feet of PYREX brand glass piping in use today. If you are not enjoying the trouble-free corrosion resistance of PYREX pipe because you are worried about breakage, why not talk to people who use it daily. We shall be glad to furnish names.

Now even more durable

All PYREX pipe ends and fittings (except U-bends) are now tempered, which makes them much stronger than annealed fittings. They're strong enough to drive nails.

Cuts maintenance problems

The liquid-smooth surface of PYREX pipe does not pit. It stays clean longer. Cleaning, when necessary, is easy, for you see the interior of the pipe at all times. Maintenance is practically nil.

What does it cost?

PYREX pipe's initial cost is lower than most other corrosion resistant piping. Installation cost is low—even lower when your own men do it—and so is maintenance. Service is long.

More information for you

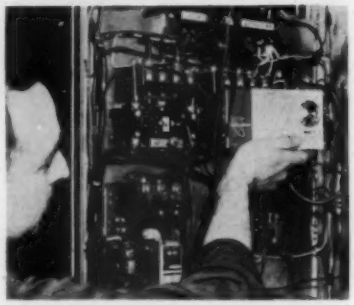
Let us send you informative bulletins. Circle the reader inquiry form at the back of this publication. Or, write direct to The Plant Equipment Sales Dept., Corning Glass Works, Corning, New York.

CORNING GLASS WORKS
10-4 Crystal Street, Corning, New York
Corning means research in Glass

For more facts circle 556 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 60)



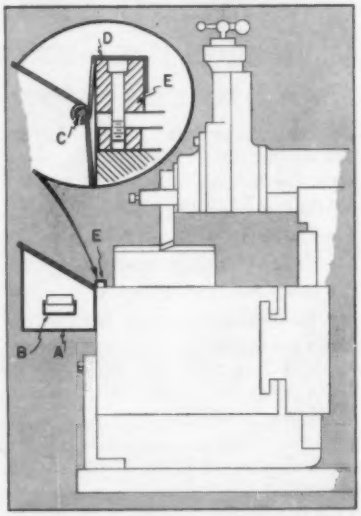
Electrical troubleshooter uses all-transistor radio to find source of interference

quickly and easily by using the tubeless transistor radio, because of its extreme sensitivity in picking up "hum" emanating from the trouble source.

Chip Catcher for Shaper

Contributed by F. E. Riley

MODERN SHAPERS, capable of taking heavy cuts, throw chips from the cutting tool with considerable force. Consequently, the chips become scat-



Position of chip tray on shaper. Block E, bolted to table, holds tray in position

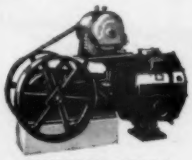
tered around the machine, constituting a personnel safety and comfort hazard. Not only are the chips awkward to walk on, but they rapidly destroy leather or rubber shoe soles.

Effective trays or bins can be fitted to shaper tables to catch most of the chips as they leave the cutting tools. A suggested form, A, is shown in the accompanying drawing. Made of sheet

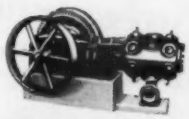
Heavy-duty
ES compressors

provide maximum efficiency in a
WIDE RANGE OF APPLICATIONS

. . . with unusual flexibility of drive and cylinder arrangements



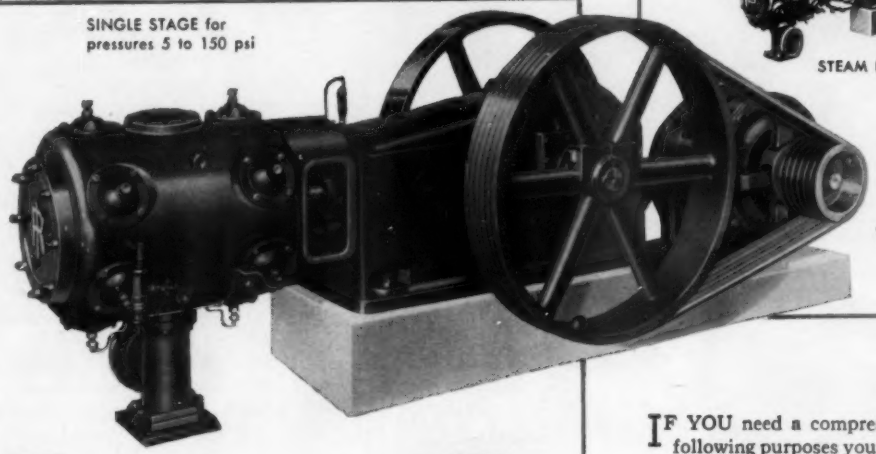
OVERHEAD MOTOR



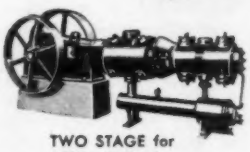
DIRECT-CONNECTED SYNCHRONOUS MOTOR

STEAM DRIVE

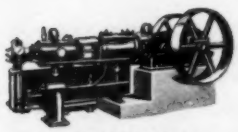
SINGLE STAGE for pressures 5 to 150 psi



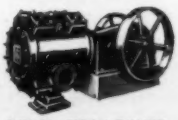
V-BELT DRIVE



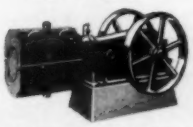
TWO STAGE for 150 to 500 psi



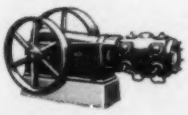
THREE STAGE for 500 to 2500 psi



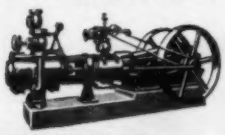
DRY VACUUM PUMPS . . . single or two stage



STEAM-PRESSURE BOOSTERS



NON-LUBRICATED CYLINDERS for oil-free air or gas



REFRIGERATION UNITS for ammonia or other refrigerants

IF YOU need a compressor for any of the following purposes you should consider the Type "ES" compressor . . . a standardized, yet extremely flexible compressor built by Ingersoll-Rand, the pioneer compressor builder.

- To compress air or gas to any pressures between 5 and 2500 psi, or for pulling vacuums. (Stock cylinders are normally available for all frame sizes, see illustrations.)
- For capacities requiring from 7½ to 150 horsepower. (Six frame sizes are available.)
- For continuous full-load operation day after day, week after week.
- For handling poisonous, inflammable, or other gases where leakage must be avoided.
- Where compressed air or gases must be free of all traces of oil. (Type NL cylinders require no oil, glycerine, grease or water for lubrication.)
- Where a future change in pressure conditions may call for a change in cylinder sizes.
- Where power cost is an important factor.
- To act as an economical standby unit for larger compressors whose full capacity is not required at all times.

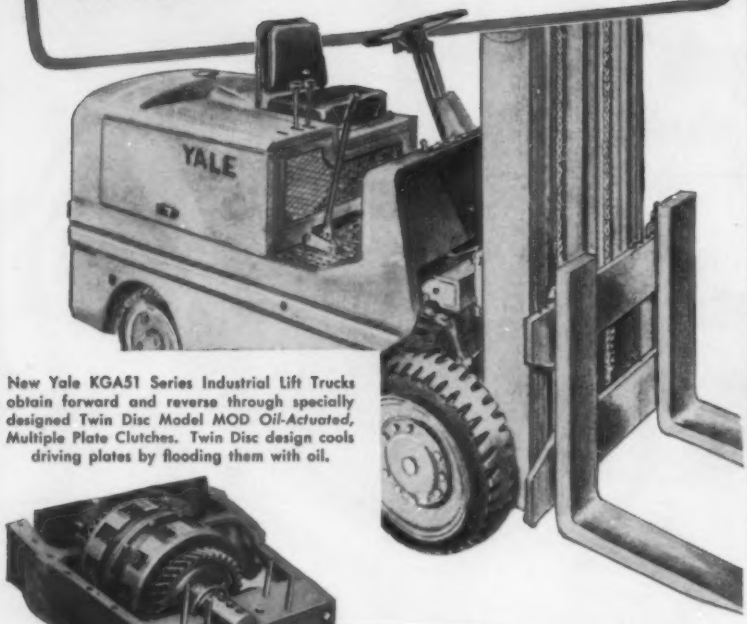
Ingersoll-Rand

1-347 11 Broadway, New York 4, N. Y.

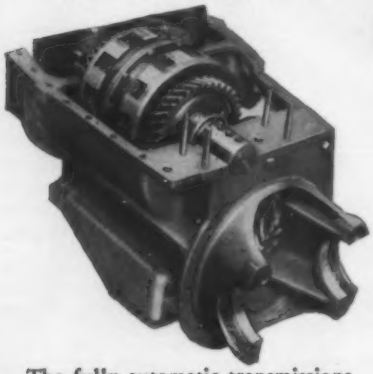
COMPRESSORS • CONDENSERS • AIR & ELECTRIC TOOLS • TURBO BLOWERS • PUMPS • ROCK DRILLS • GAS & DIESEL ENGINES

For more facts circle 558 on Reply Card

Forward and reverse on new Yale KGA51 Series obtained by specially designed *TWIN DISC CLUTCHES*



New Yale KGA51 Series Industrial Lift Trucks obtain forward and reverse through specially designed Twin Disc Model MOD *Oil-Actuated,* Multiple Plate Clutches. Twin Disc design cools driving plates by flooding them with oil.



The fully automatic transmissions in the new Yale KGA51 Series Industrial Lift Trucks obtain forward and reverse motion through specially designed Twin Disc Model MOD *Oil-Actuated,* Multiple Plate Clutches.

Because of the severe energy cycle of the vehicle, a specific clutch for finger-tip control was required. Twin Disc Engineers *worked closely* with the manufacturer in developing such a clutch. In the special Twin Disc design, oil is pumped through the shaft and cools the driving plates *by flooding them with oil.* Sintered friction material is also used, because of the high energy loading.

If you have a specific power linkage problem, on your powered equipment, consult Twin Disc Specialists . . . ask them to assign you a project engineer. Twin Disc Clutch Company, Racine, Wisconsin.

TWIN DISC

TWIN DISC

Friction Clutches and Fluid Drives

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois

Branches or Sales Engineering Offices: Cleveland • Dallas • Detroit • Los Angeles • Newark • New Orleans • Tulsa

For more facts circle 559 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 60)

metal, it is slightly longer than the width of the front end of the table. The rear face is raised above the level of the table to form a stop for the flying chips. The sides are fitted with handles so that the tray may be removed for emptying.

Simple metal clips secure the bin to the table. The upper edge is wired and the wire (C, inset) is exposed at two positions on the front end, for accommodation of the bent metal clips that support the bin. Short lengths of bar stock are bolted at two of the table's T-slots to form anchorages for the clips.

Where a lot of heavy roughing work is to be done, a second bin on the side of the table is often practical, to collect maximum amount of loose chips.

The trays should not be of large volume, because they will soon get overloaded, and difficult to handle. The volume can be controlled by making the trays as shallow as practical.

Shaper Does Double Duty

DESIGNED to double output on wood shapers at Jansa Woodworking Corp., Brooklyn, N. Y., a production technique has been worked out for eight Delta shapers in use at the plant. The firm manufactures fine wood boxes and cabinets used by the television, electronics and instrument industries.

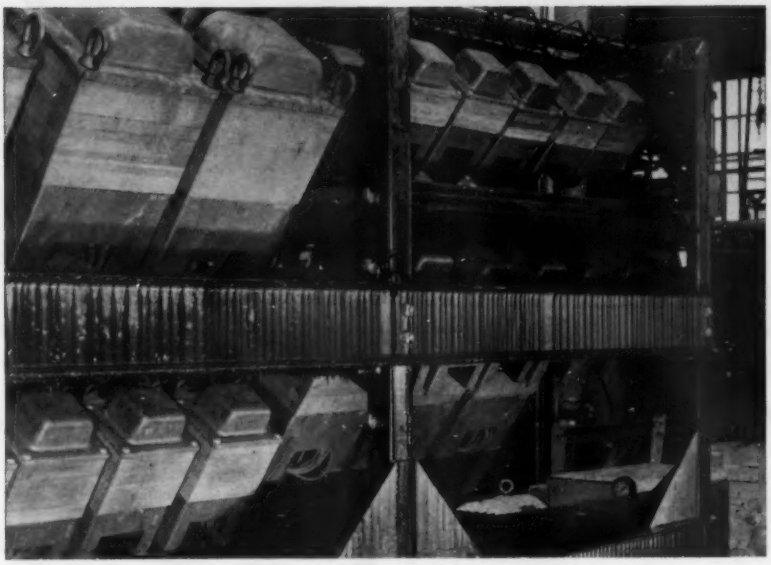
On a box requiring bottom and side edge shaping, two workers utilize a single machine. Production rate has doubled since the two-man, two-box operation was begun, and experience shows that neither operator interferes with the other's efficiency.

Photo: Delta Power Tools

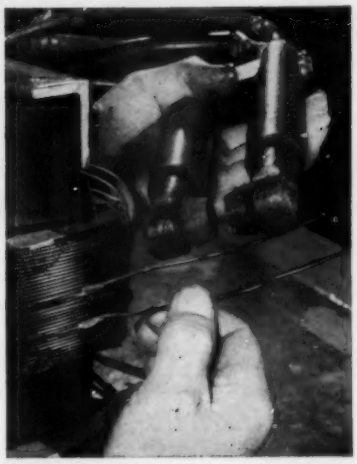
Shaper operators double up on a single cutter to speed shaping of wooden boxes

Dry-Type Transformer | NEWS

New Line of G-E Voltage Stabilizing Transformers



Standard design will stabilize a 30% voltage change to 1% nominal within 1½ cycles



G-E voltage stabilizing transformers are tested to find the proper turn ratio on the secondary coil. A tap lead is then brazed to this turn to give positive ±1% turn ratio.

NEW VACUUM IMPREGNATION PROCESS GIVES G-E DRY-TYPE TRANSFORMERS LONGER LIFE

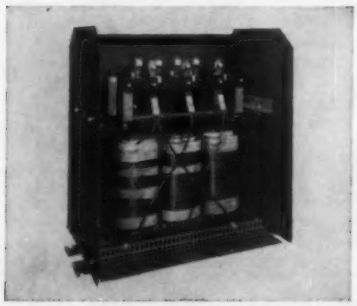
G-E dry-type transformers now give even longer life because the entire core and coil assembly is thoroughly impregnated by an automatically controlled vacuum-pressure process which removes all moisture, gives higher insulation strength and combats corrosive atmospheres. Varnish insulation penetrates the entire unit, and not merely the exposed surfaces. These units available in all standard ratings.

With G-E voltage stabilizing transformers in the circuit, control voltage can be held high enough to prevent relays and solenoids from dropping out under adverse line disturbances. Lightning is a typical example of a disturbance which occurs in most parts of the country. As the lightning charge bleeds off the line through arresters, the line voltage may drop to as low as 30% of normal for a period of approximately 2 to 20 cycles. Properly applied, G-E voltage stabilizing transformers will hold the voltage level up sufficiently to keep the relays locked-in.

G-E voltage stabilizing transformers are available in standard ratings from 15 to 10,000 volt-amperes.

For further information write General Electric Company, Section 410-23, Schenectady 5, New York. Ask for Bulletin GEA-5754.

NEW TYPE D TRANSFORMERS EASY TO CONNECT, SIMPLE TO MAINTAIN



Both the top and sides of the new square case design are easily removed to simplify installation and maintenance. Connections are easily made to solderless connectors in the large, roomy wiring compartment. Thus, as plant power requirements change, G-E Type D transformers can be readily moved to new locations. See your distributor, he has most popular ratings in stock.

GENERAL ELECTRIC

For more facts circle 560 on Reply Card

Moynos pump mustard to the filling line at Plochman & Harrison, Chicago and Jersey City. The Moyno can carry liquids, pastes, solids in suspension, abrasive-laden slurries—almost anything that will go through pipe—with positive, non-pulsating pressure.

Mustard Mill Changes to MOYNO® Pumps to Get Positive Displacement, Longer Pump Life

A Moyno Pump installation at Plochman & Harrison, makers of the famous Premium Brand Mustard, illustrates the outstanding performance of the Moyno Pump. They have been pumping mustard to a filling line with the Moyno for over two years without a single replacement of parts. They are replacing other pumps with Moynos.

The mustard is pumped as a semi-solid. In addition, it has both an acid and an abrasive content which causes other pumps to wear out in a few months. Moynos handle a wide variety of products that are not pumpable with other types of pumps. These include potato salad, chow mein, fruit, acid, alkalis, pastes, abrasive slurries, paints, tar, cement, plaster, many others.

The Moyno has a unique rotor and stator arrangement which forms sealed progressing cavities that move the material, providing positive displacement. For this mustard handling job parts were made of stainless steel to assure trouble-free service and long pump life. Rotor and stator are available in other alloys, or plastic compositions.

Note the outstanding features of the Moyno shown at the right. Perhaps your pumping problems can be solved with the Moyno. Write us today! Ask for a free copy of Bulletin 30-PE. It will give you complete facts!

Features of the MOYNO that may solve YOUR pumping problem

Gentle: no churning; won't break up semi-solids . . . won't aerate liquids. May be used for metering.

Reversible: pumps with equal efficiency in either direction.

Trouble Free: self priming; won't cavitate or vapor-lock. Just one moving part—no valves to stick, no pistons to gum up. Built for tough service. Easy to maintain.

Positive Displacement: Moynos are available to pull up to a 29" vacuum while discharging under pressure. Big Moynos deliver up to 500 g.p.m. Pressures to 600 p.s.i. plus are available.

ROBBINS & MYERS, INC.

R&M®

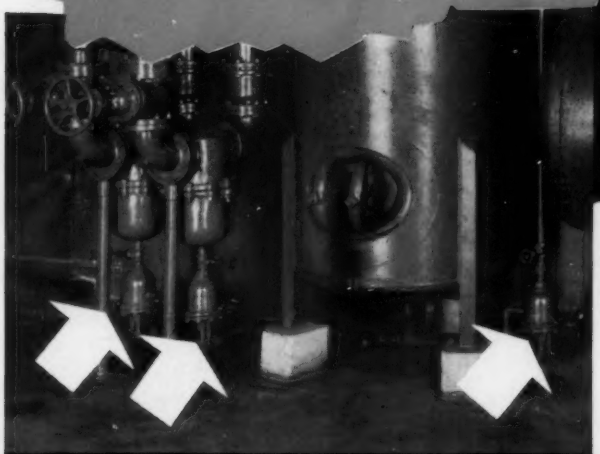
SPRINGFIELD, OHIO • BRANTFORD, ONTARIO

Fractional and Integral HP Motors | Household Fans | Hoists and Cranes | Large and Small Moyno Pumps | Propellair Industrial Ventilating Equipment

For more facts circle 561 on Reply Card

Armstrong Air Traps

Make Compressed Air Systems Work Better



Automatic moisture removal prolongs life of compressed air tools—prevents moisture contamination of air at point of use...

SELECTION of air traps for automatic removal of moisture from intercoolers, aftercoolers, separators and drip points in compressed air systems involves consideration of these factors:

1. **Amount of condensate.**
2. **Air pressure.**
3. **Presence of oil in the system.**
4. **Trap cost.**
5. **Trap dependability.**

Armstrong manufactures a complete line of ball float and inverted bucket traps to meet any load or pressure requirements. The economies of mass-producing annually thousands upon thousands of castings, forgings and parts, many of which are used interchangeably in Armstrong steam and air traps, is reflected in exceptionally high quality at moderate price. All mechanisms are of wear- and corrosion-resistant stainless and chrome steels. All traps are unconditionally guaranteed to satisfy the user.

Three basic styles of traps are offered, as shown at the left, to provide the best answer to a given requirement. You will assure peak performance of your compressed air system, with minimum maintenance when you trap with Armstrongs.

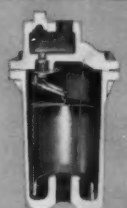
Here are the high quality, low cost air traps to handle every job!

No. 71—$43.00 list.
Height 10⅞". Wt. 29 lbs.

No. 71 Snap Action Ball Float Trap. A spring strip snaps the valve open and shut, eliminating hunting, wire-drawing and trouble from fine dirt or light oil. Ideal for air line separators.

No. 21—$16.00 list.
Height 5¼". Wt. 8 lbs.

No. 21 Direct Acting Ball Float Trap. Recommended for draining small separators and air line drips. Popular on systems using small, light duty compressors.



No. 213 SW—$29.00 list.
Height 10¾" Wt. 21 lbs.

No. 213 SW Inverted Bucket Trap. Recommended for draining aftercoolers, intercoolers, and receivers where heavy oil is present. While there is a small air loss from this trap, it is a small price to pay for the *only* trap that will do the job!

Get Them From Local Stock!

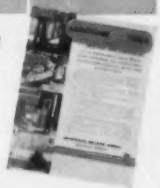
Call your nearby Armstrong Representative or Distributor, or write:

Guide to Air Trap Selection

Type of Trap	No. 71 Snap Action	No. 21 Ball Float	No. 213 SW Inverted Bucket
Handles oil?	Light oil only	Light oil only	Very well
Handles dirt?	Moderate	Moderate	Very well
Air loss?	None	None	Small
Requires priming?	No	No	Yes
Float collapse or leakage?	Remote	Remote	Impossible
Gravity drainage to trap required?	Yes	Yes	No

Bulletin FREE on Request

Now is the time to improve your compressed air moisture removal system. This bulletin tells how—gives complete data and prices of Armstrong Air Traps. Send for your copy today.



ARMSTRONG MACHINE WORKS
912 Maple Street • Three Rivers, Michigan

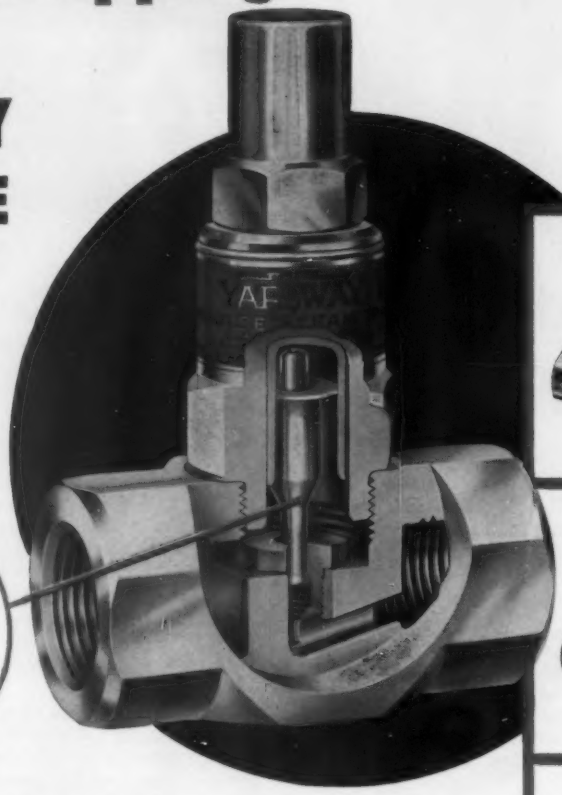
Made by the makers of

ARMSTRONG *Inverted Bucket* STEAM TRAPS

For more facts circle 562 on Reply Card

the impulse that revolutionized steam trapping

YARWAY IMPULSE STEAM TRAP



the only moving part

...a small stainless steel valve that literally floats on the condensate load. Gets equipment *hot in a hurry*—and *keeps it hot!*

SERIES 60 and 120

For all *normal* trap requirements, pressures to 400 and 600 psi.

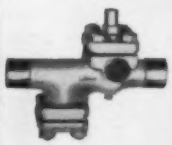
½" No. 20-A

For *light loads* on tracer lines, steam mains, small presses, etc.

SERIES 40

For *heavy loads* requiring extra high capacity steam traps.

INTEGRAL-STRAINER HIGH PRESSURE TRAP



For high pressures, high temperatures. (Flanged or welding connections.)

Twenty years ago YARWAY applied a unique theory of thermodynamics to steam traps—and gave industry the amazing YARWAY Impulse Steam Trap.

Today — over a million YARWAY Impulse Steam Traps later — advantages like the following continue to convert new users, and convince old users to standardize on the YARWAY Impulse:

- **QUICK HEAT-UP AND EVEN TEMPERATURES OF EQUIPMENT**
- **GOOD FOR ALL PRESSURES WITHOUT CHANGE OF VALVE OR SEAT**
- **SMALL SIZE—LIGHT WEIGHT**
- **ONLY ONE MOVING PART**
- **STAINLESS STEEL—minimum maintenance**
- **WON'T FREEZE UP**
- **A COMPLETE LINE of sizes and types for every requirement**
- **IMMEDIATELY AVAILABLE from 270 local Industrial Distributors**

For free Trap Selector, or 24 page Bulletin, write

YARNALL-WARING COMPANY
145 Mermaid Avenue, Philadelphia 18, Pa.

YARWAY IMPULSE® STEAM TRAP

OVER 1,000,000 YARWAY IMPULSE STEAM TRAPS USED

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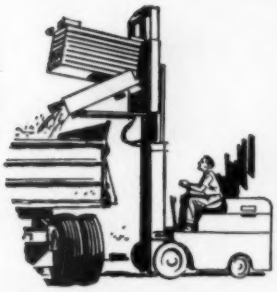
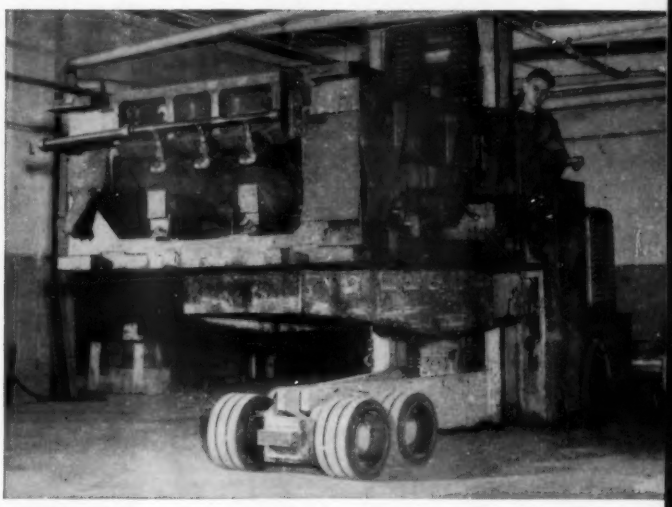
B.F.Goodrich
Materials Handling News and Views

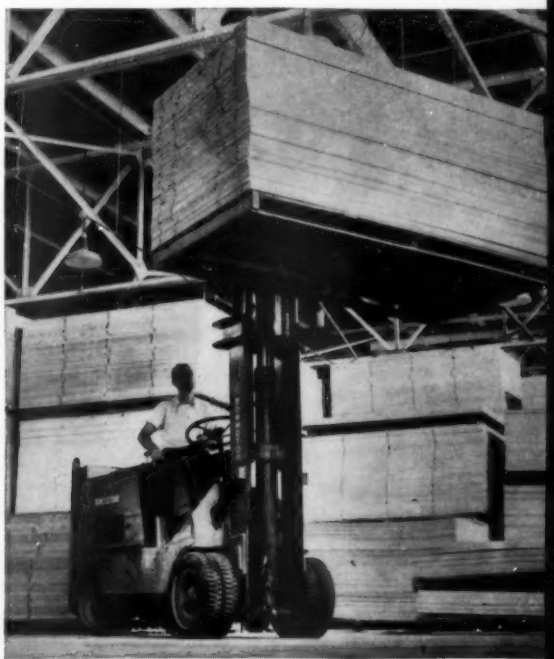




Typical problem: moving a 7-ton door die—In the complex materials handling set-up at Willys Motors Toledo plant, virtually every threat to tire life can be found. That's why the company had a B. F. Goodrich Tire and Wheel Analysis man study its 2,000 units, loads, hauling surfaces, etc. The result: "Industrial tires give us far longer, trouble-free service—and this saves us money."

This truck goes everywhere—thanks to its tires—The B. F. Goodrich Tire and Wheel Analysis man knew this job required traction, but he also knew dock areas and factory yards can quickly destroy pneumatic tires. That's why he recommended Pressed-On Deluxe Cushion Lug tires that give maximum traction without the danger of flats.

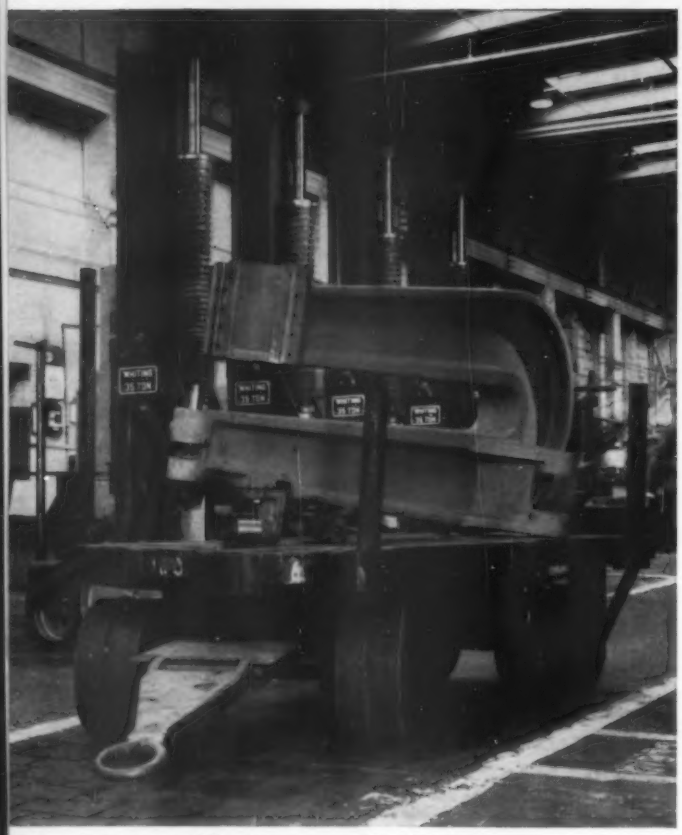
500 hours' service and the tires "fell apart"—Maintenance men at a large Cleveland forge plant found industrial tires in heavy-duty service were "falling apart" after only 500 hours. They called in the local B. F. Goodrich Tire and Wheel Analysis man, who recommended new Pressed-On Deluxe Cushion tires with oil-resisting compound. Result: tire life increased over 500%.



Why pneumatic tires here? Giant loads carried over smooth floors move faster on pneumatic tires. Time and labor costs are cut with pneumatics because bigger loads can be hauled.

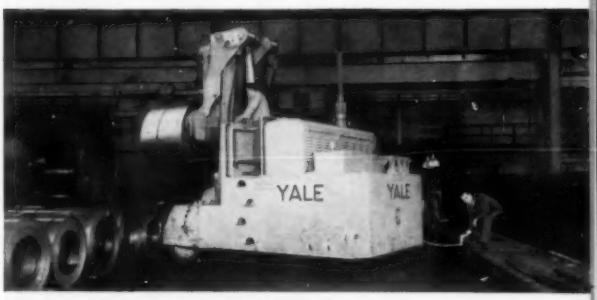
more

B.F.Goodrich
industrial tires at work



Switch to rubber tires saves $1,000 a year—Whiting Corp. of Harvey, Ill., used steel wheels on trailers carrying 10,000-pound loads. Aisle maintenance cost about $1,000 a year. Trailer maintenance added more. Then they took the advice of the BFG Tire and Wheel Analysis man and switched to pressed-on tires. Since then there has been no trailer maintenance and aisle repairs have been negligible.

Why Bower Roller Bearing Co. is 100% BFG—25 to 30 materials handling units haul raw materials, finished products and scrap at the Bower Roller Bearing Co., Detroit. And all these jobs are done on B. F. Goodrich industrial tires because they do a better job of combating iron and steel scrap and oily floors, says Plant Superintendent A. F. Madison.



Tires carry steel—tons at a time—When he saw this materials handling job, the B. F. Goodrich Tire and Wheel Analysis man knew right away it called for Pressed-On Grooved Tread tires. They are built to carry tremendous loads and are available with Universal compound that resists cutting by steel scrap.

Specify B. F. Goodrich tires when ordering new equipment

RESEARCH KEEPS B.F.Goodrich FIRST IN RUBBER

The B. F. Goodrich Company
Tire & Equipment Division
Department TW-571, Akron 18, Ohio

I would like further information on your FREE TW Analysis Plan.

Name _____

Company _____

Street _____

City _____ Zone ____ State ____

How FREE TW TIRE AND WHEEL ANALYSIS saves you money

Do you know which industrial tires—which sizes, tread designs and tread compounds—are right for your materials handling jobs? Your B. F. Goodrich Tire and Wheel Analysis man does. He'll make a *free* survey of your operations, then give unbiased advice on the right tires for you to use. His recommendations can save you as much as 50% on tire costs, as much as 20% on maintenance costs. Get your equipment on the right tires *now* by mailing the coupon today. This B. F. Goodrich service costs you nothing. A consulting service is available to manufacturers of materials handling equipment.

For more facts circle 557 on Reply Card

outlasts ordinary plastic skylights... SIX-TO-ONE!

NEW *Granitized** Corrulux®

Proven conclusively with accelerated erosion tests conducted by independent laboratories!

Surface erosion by wind, dust and sleet reduces light transmission of ordinary plastic skylights by as much as 50% in 2 to 3 years. Now . . . **new** *Granitized* CORRULUX with super-erosion-resistance, tested against competitive panels, gives up to six times longer service life . . . lasting beauty and light transmission.

Don't buy **any** plastic panel until you have checked new *Granitized* CORRULUX. Flat or corrugated, shatterproof! Three skylighting colors for your choice of light transmission.

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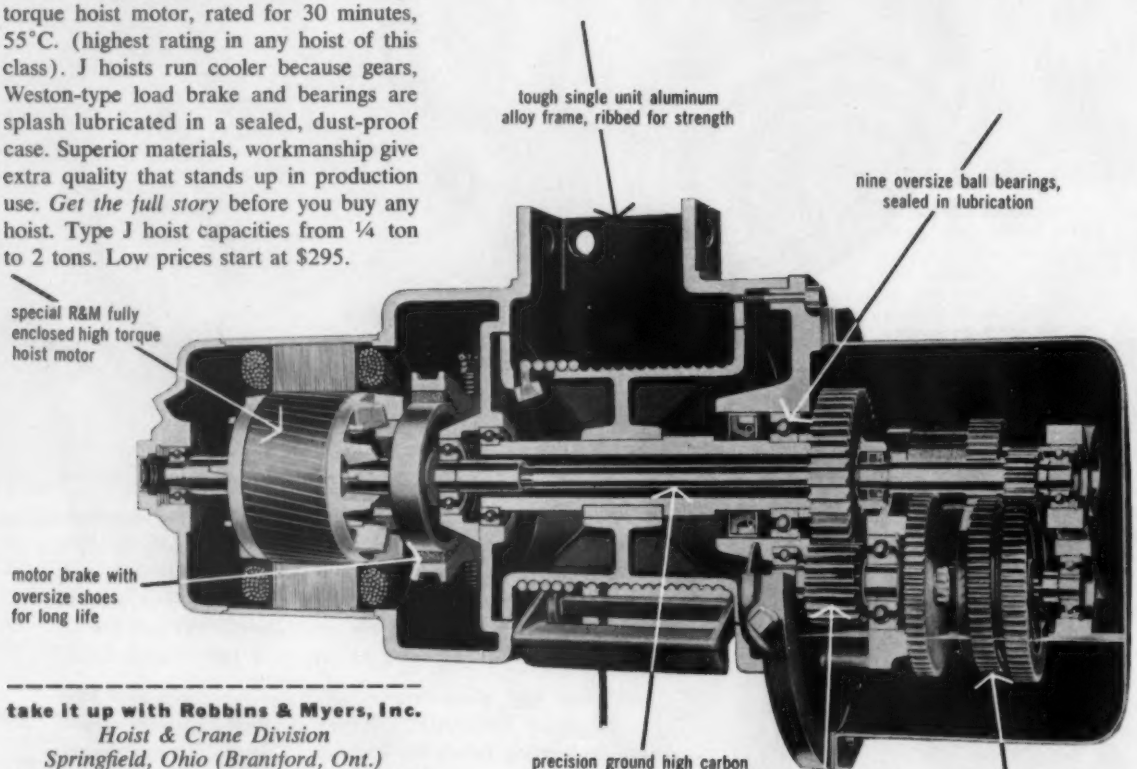
R&M J hoists give you the biggest quality lifting package at a reasonable cost, and here's why: First, there's no compromise on material—high strength carbon or alloy steel shafts and gears; tough, flexible plow steel cable; oversize bearings, load brake, and shafts—all last longer under punishing loads. No compromise on workmanship, either—each of the triple reduction spur gears is wide-faced, precision cut and heat treated; the motor is R&M's own high torque hoist motor, rated for 30 minutes, 55°C. (highest rating in any hoist of this class). J hoists run cooler because gears, Weston-type load brake and bearings are splash lubricated in a sealed, dust-proof case. Superior materials, workmanship give extra quality that stands up in production use. *Get the full story* before you buy any hoist. Type J hoist capacities from ¼ ton to 2 tons. Low prices start at $295.

buy value you can see


tough single unit aluminum alloy frame, ribbed for strength
nine oversize ball bearings, sealed in lubrication
special R&M fully enclosed high torque hoist motor
motor brake with oversize shoes for long life
precision ground high carbon or alloy steel shafts
triple reduction wide-face spur gears, heat treated
oversize Weston-type load brake, runs in oil

take it up with Robbins & Myers, Inc.
Hoist & Crane Division
Springfield, Ohio (Brantford, Ont.)
Send me J hoist bulletin. *(PE)*

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THE MATERIAL HANDLING INSTITUTE'S EXPOSITION Cleveland, Ohio 1956 mhi BOOTH 1417

ROBBINS & MYERS hoists • cranes • winches

For more facts circle 565 on Reply Card

MICRO *precision switches*

...THEIR USE IS A PRINCIPLE OF GOOD DESIGN

Switches on valve operator are actuated by Cams "A" and "B" as the valve rotates in either direction.

Explosion-proof switches provide automatic control on valve operator

MICRO SWITCH explosion-proof switches were installed on the gas valve operator by the engineer of a Texas gas company to provide safe and automatic control.

Two switches were placed so that they may be operated by cams as the valve rotates in either direction. The switches control the gas supply and turn on indicating lights when the valve is turned to either extreme position by the pressure of natural gas which it contains. The valve-operator is electrically controlled but is powered by gas.

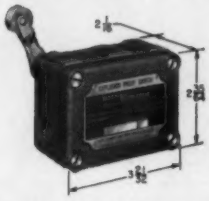
Double-pole, double-throw switches are used because each switch is required to perform two functions. When the valve reaches either limit, one of the switches is actuated to open or shut off the supply of gas and turn on a light on the control panel, which shows the position of the valve.

Explosion-proof switches are used to insure that no escaping gas will be ignited when electrical contact is made.

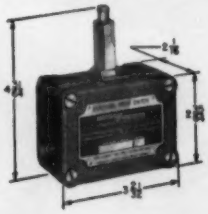
This installation is typical of thousands of such uses, which plant operating men, plant engineers, and maintenance superintendents are making of MICRO precision switches on present plant equipment. Production is increased by making machinery more automatic. Both operators and machines are protected when switches are used to prevent premature operation of equipment.

MICRO SWITCH Explosion-proof Switches (EX Series)

MICRO SWITCH "EX" Series of explosion-proof switches are listed by Underwriters' Laboratories for use in hazardous atmospheres of Class I, Group C (ethyl ether vapor) and Group D (gasoline, petroleum naphtha, alcohols, acetone, lacquer solvent vapors and natural gas); Class II, Group E (metal dust), Group F (carbon black, coal or coke dust), and Group G (grain dust)



This switch, which is shown in action in the gas company installation, is designed for cam or slide operation. The actuator arm is operated by clockwise rotation and is adjustable through 360°. Standard contact arrangement is single-pole, double-throw.



This push-rod plunger switch is designed for use as a limit switch on in-line motion applications. A stop ring near the plunger tip limits the overtravel and permits a steady load of as much as 100 pounds on the plunger without injury to the enclosed precision switch. Standard contact arrangement is single-pole, double-throw.

ELECTRICAL RATINGS

15 amperes 125, 250 or 460 volts a-c; ½ ampere 125 volts d-c; ¼ ampere 250 volts d-c.

Other explosion-proof switches in the MICRO "EX" Series include a cross roller lever switch for use where the operating mechanism approaches from a direction perpendicular to the longitudinal axis of the switch. The switch is also available with a large paddle-shaped actuator for manual control of power equipment.

Send for Catalog 101 "Switches for Industry"

MICRO SWITCH distributors are located in key cities everywhere. They have full stocks of switches for plant use applications. Look in the Yellow Pages under "Switches, Electric."

MICRO SWITCH

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

In Canada, Leaside, Toronto 17, Ontario • FREEPORT, ILLINOIS

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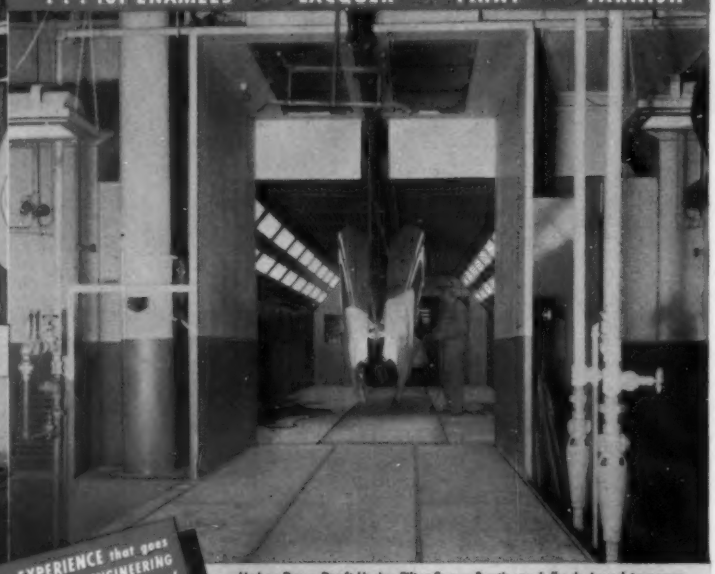
COMPLETE *Finishing* SYSTEMS

. . . for ENAMELS • LACQUER • PAINT • VARNISH

Mahon ventilated Flash-Off Enclosure between Hydro-Filter Spray Booth and the Finish Baking Oven on the roof above.



Mahon Down-Draft Hydro-Filter Spray Booth specially designed to accommodate a variety of automobile parts other than body parts.

. . . the EXPERIENCE that goes into the PLANNING and ENGINEERING of MAHON EQUIPMENT is the item of GREATEST VALUE to YOU!

Mahon filtered Air Supply System and Mahon Finish Baking Oven installed on the roof of the plant.

Interior of Mahon Air Supply System showing one bank of Filters of the Air Filtering Equipment and the Direct Gas-Fired Air Preheating Unit.

Small Parts FINISHING LINE OCCUPIES MINIMUM SPACE INSIDE PLANT!

To meet requirements in this particular installation, where floor space was a restricting factor, Mahon engineers built the space-consuming units of the finishing system on the roof of the plant. This is not unusual . . . today, Mahon can point to hundreds of installations in which major parts or entire finishing systems have been built and housed on the roof of plants where floor space inside the plant was at a premium. If you are contemplating new finishing equipment, you, too, will want to discuss methods, equipment requirements and possible arrangements with Mahon engineers. You will find them better qualified to advise you, and better qualified to do the all-important planning, engineering and coordinating of equipment which is the key to fine finishes at minimum cost. And, if you care to investigate, you will find that Mahon equipment will serve you better . . . because, Mahon equipment is engineered better and built better for more economical operation over a longer period of time. See Mahon's Insert in Sweet's Plant Engineering File, or write for Catalog A-656. Better still, why not have a Mahon engineer call at your convenience.

THE R. C. MAHON COMPANY • Detroit 34, Michigan

SALES-ENGINEERING OFFICES in DETROIT, NEW YORK and CHICAGO

Engineers and Manufacturers of Complete Finishing Systems—including Metal Cleaning, Pickling and Rust Proofing Equipment, Hydro-Filter Spray Booths, Dip and Flow Coaters, Filtered Air Supply Systems, Drying and Baking Ovens, Cooling Tunnels, Heat Treating and Quenching Equipment for Aluminum and Magnesium, and other Units of Special Production Equipment.

MAHON

For more facts circle 567 on Reply Card

COURT DECISIONS — a summary of legal findings of interest to the plant engineer

Prepared by Albert Woodruff Gray

Employer's Instructions

SUIT WAS BROUGHT by a workman for injuries from a fall caused by using an alligator wrench on which, as he said, "There wasn't any teeth on one side and it was all worn off on the other." He had been engaged in straightening a brace in a hopper car and given this tool by his foreman. The wrench had slipped and the workman fell to the ground.

Application was made by the employer to set aside a verdict in this action in favor of the employee on the ground that the workman had testified at the trial that he had examined this tool in spite of having signed a statement after the accident that he had never looked at the jaws of the wrench.

"It is not the province of the court to substitute its judgment for that of the jury and, where as here the case turns on controverted facts and the creditability of witnesses, the case is peculiarly one for the jury," said the court in refusing to set aside this verdict.

"Even if I were to assume that this contradiction between the statements after the accident would justify the expurgation of testimony during trial, nevertheless the jury's verdict as to liability could well be sustained on testimony developed to show that the employee was directed to perform a new mechanical operation without any instruction in the use of the tool employed." Quirin v. Pennsylvania Railroad Co., 106 F. S. 277.

Product Labeling

JUDGMENT AGAINST a manufacturer of roofing primer for $111,035 for failure to attach a cautionary label to the container was recently affirmed by an appellate court of the state of Washington. This roof primer, 60 per cent asphalt and 40 per cent naphtha cutting agents, had been sold with a pamphlet of instructions relating to roof coating, not primer, with the caution, "Do not heat or thin. Do not heat with an open flame. Do not thin it. When either is done the waterproofing qualities are damaged. Hence a proper job is impossible. If in extremely cold weather it is necessary to heat, do so by placing the drum in a warm room 72 hours before the material is to be used."

Workmen coating the roof of an apple packing shed and warehouse in the state of Washington, placed a can of this composition on an open stove in an empty warehouse. From the gas released by the heat came an explosion and fire.

"It is argued," said the court of the defense of the manufacturer, "that the heating should not have been undertaken in the confined quarters of a warehouse but outdoors and that in this respect the user was negligent. Perhaps if we were considering the conduct of skilled workmen informed in matters pertaining to explosive or combustible qualities of gases—more especially when released in confined spaces—we would be impressed by the argument. But there is no evidence that either the user or the members of his crew belonged in that category. And we recall that the representation of the manufacturer's salesman was that the primer could be applied by unskilled workmen." Panther Oil & Grease Mfg. Co. v. Segerstrom, 224 Fed. 2d 216.

Seller's Assurance a Warranty

IN A CONFERENCE between the manager of a canning plant and a manufacturer of lug boxes for the shipment of peas which were impregnated with a preservative, the cannery manager emphasized the condition that whatever preservative was used it must not affect the taste or odor of the peas.

After an order had been placed by the cannery for approximately 2,500 of these lug boxes the manufacturer asked that the order be modified permitting the use of a different preservative in place of that originally requested. To this the cannery replied, "We will be governed by your experience in using these materials. If you can assure us we will get as good results, you have our permission to use a different preservative." To this the manufacturer replied, "We feel sure you are going to be well satisfied."

When later the peas shipped in these containers proved unfit for sale due to the presence of this compound, pentachlorphenal, the manufacturer set up in his defense to the action brought by the cannery, that it had made no warranty of the effect of the use of this preservative.

In its ruling that there had been a warranty by the manufacturer that the use of this chemical would have no effect on either the taste or odor of the contents of these lug boxes the Federal appellate court said in conclusion, quoting from the Uniform Sales Act,

"Any affirmation of fact or any promise by the seller relating to the goods is an express warranty if the natural tendency of such affirmation or promise is to induce the buyer to purchase the goods and if the buyer purchases the goods relying thereon." W. N. Clark Co. v. Miller Mfg. Co., 224 Fed. 2d 660.

Purchase Contract Canceled

BLANK FORGINGS were purchased with the agreement that the forgings should be machined and finished. When delivery was delayed, the buyer in urgent need of the finished product, agreed to a cancellation of the contract provided they deliver the blank forgings which he could have machined elsewhere.

The forgings were delivered but the purchaser failed to have them finished as he had anticipated. Ten months later he returned the forgings and refused to pay the amount agreed. In the suit brought by the seller for this amount, the buyer based its defense on the original agreement that the seller was to machine and finish the forgings, and demanded damages for the failure of the seller to fulfill this agreement.

In awarding judgment to the seller, the Texas court said, "The manufacturer sold the forgings to the purchaser without warranty, expressed or implied. In fact, the buyer purchased the blank forgings 'as is.' The contract for machining and finishing the forgings was canceled by mutual agreement and a binding contract was entered into between the parties under which the buyer purchased the forgings on these conditions." Precision Aircraft Parts, Inc. v. Southwest Tool & Die Co., 280 S.W. 2d 384, Texas.

Illegal Picketing

AN INJUNCTION was granted by a Louisiana court, against the United Mine Workers of America, District 50, restraining the union from picketing a manufacturing plant in that state. This picket line had been established when the manufacturer had refused to recognize the union as a bargaining agent for the employees, as it had failed to comply with the statute requiring the filing of non-commu-

COURT DECISIONS

nist affidavits and had not been recognized by the National Labor Relations Board.

In its decision sustaining this injunction, the appellate court of that state said, "The company's refusal to recognize the union was not in violation of any obligation imposed by law. The picketing was the employment of economic pressure, illegally, for the purpose of causing the employer irreparable injury for which it has no adequate administrative or legal remedy, and it is this injurious conduct which the state has jurisdiction to relieve." Arkansas Flooring Co. v. United Mine Workers of Am., District 50, 81 So. 2d 413, Louisiana.

Acceptance of Part Delivery

UNDER A CONTRACT for the purchase of 2,400 refrigerating units, to be delivered in equal instalments over a twelve month period, after delivery of 1,025 the purchaser refused to accept further shipments on the ground that the refrigerators delivered did not conform to the contract.

In the lawsuit that followed, the purchaser sought not only to recover damages in the goods he accepted but also any money he had advanced on future shipments.

The seller insisted, however, that the purchaser, in failing to give notice of these defects within a reasonable time had not only lost right to recovery of damages but also the right to refuse delivery of the equipment still to be shipped under this contract.

In its decision, sustaining the contention of the buyer, the court said, "The rule supported by the weight of authority is that the acceptance by a buyer of one or more shipments of defective goods does not amount to such a waiver of the defects as to preclude the buyer from rejecting subsequent shipments.

"The refusal of the buyer to accept subsequent shipments is upheld on the ground that he was justified in assuming that they would contain defective material." Universal Major Electrical Appliances v. Glenwood Range Co., 223 Fed. 2d 76.

Right to Arbitrate

UNDER A CONTRACT in which the patentee of a water heater granted to another the right to manufacture, market and distribute this invention, it was provided, "This agreement shall be governed by the laws of the state of New York and in the event of any disputes between the parties hereto such dispute shall be determined by arbitration in the City of New York in accordance with the rules then prevailing of the American Arbitration Association."

When suit was brought by the owner of the patent under this agreement for the collection of unpaid royalties this provision of the contract for arbitration was set up as a defense by the manufacturer with a demand that the action be held in abeyance until the matters in dispute had been arbitrated. The patent owner on the other hand insisted that there was no dispute for arbitration and asked for a denial of the application.

In relation to the contention of the patentee that there was no dispute to arbitrate, the court cited an earlier decision in that state in which it had been said by the court, "The parties have agreed that their disputes arising relative to the fulfillment of the terms of the contract shall be settled by arbitration. It is the duty of the court to enforce their agreement rather than to undertake itself to settle the dispute or to narrow the field of arbitral disputes."

In following the authority of this decision the court said in conclusion, "Whether or not there is a bona fide dispute under a written agreement for arbitration is a question of law and the Court may refuse to allow arbitration if it finds that in fact no bona fide dispute prevails." Thermo Electric Corp. v. Kremers, 143 N.Y.S.2d 255, New York.

Sale of "All Requirements"

IN A CONTRACT by corrugated paper box jobbers with a manufacturer, it was provided, "The seller hereby agrees to sell and deliver and the buyer hereby agrees to purchase all of buyer's requirements of corrugated paper products not to exceed 200 carloads per annum during the period of five years.

"In the event that the buyer shall desire to purchase more than 200 carloads per annum it shall first offer such excess purchases to seller for acceptance by it. In the event that seller shall refuse to accept such orders in whole or in part, then the buyer shall be privileged to make such purchases as shall have been turned down by seller, from other sources of supply."

Later the purchaser received the consent of the seller for an outside purchase which the seller however, limited to that single instance. Shortly after, the buyer embarked on a large scale purchasing campaign with neither the consent or knowledge of the seller. Upon discovering this action the seller terminated the contract and the buyer sued for what it claimed was a breach of the agreement.

"Though buyers were not required to purchase a single box," said the court, absolving the seller from the breach of contract charge, "yet if they had requirements they were bound to submit them to the seller. This was the core and crux of the contract from the seller's standpoint. At a time when a seller's market prevailed it is clear that the dominant measure of advantage to the seller in entering into such a contract was the right to accept the most desirable orders in meeting its obligations to furnish buyers with at least 200 carloads per year of its total requirements and the right to fill as much as it desired of buyers' requirements in excess of 200 carloads per year.

"That the buyers' willful departure from a fundamental obligation under the contract constitutes a material violation thereof is too apparent to admit of controversy." Wilson v. Corrugated Kraft Containers, 256 Pac. 2d 1012, California, July 2, 1953.

Delayed Delivery

CARGO SPACE was bought for 18 cases by a United States manufacturer for goods consigned to Rio de Janeiro, Brazil, aboard a Delta Line vessel loading at New Orleans and contract made with a freight forwarder for transportation and loading on the S. S. Cuba Victory. Instead, the freight forwarder loaded the cases in two units on a New York pool car and from there the cases were reshipped and delivered at Rio de Janeiro seven months later.

On appeal from a judgment awarding the manufacturer damages for the loss of profit the freight forwarder protested that such damages were remote, speculative and conjectural. As authority for sustaining this award the Federal appellate court said:

"The law of damages is clear. The difficulty lies in the application of the law to the facts in particular cases. It is not required that the profits be definitely and absolutely proved. The breach of the contract having prevented such profits from being made, conclusive proof is impossible.

"Damages for the interruption of a going business with consequent loss of profits may be recovered where proof is introduced as to the amount of profit made in the past during a like period with the facts that the circumstances have not changed as to alter the profits during the time in question." Princess Pat, Ltd. v. National Carloading Co., 223 Fed. 2d 916.

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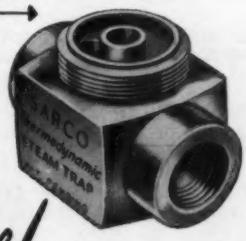

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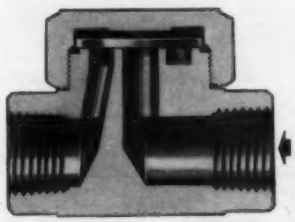

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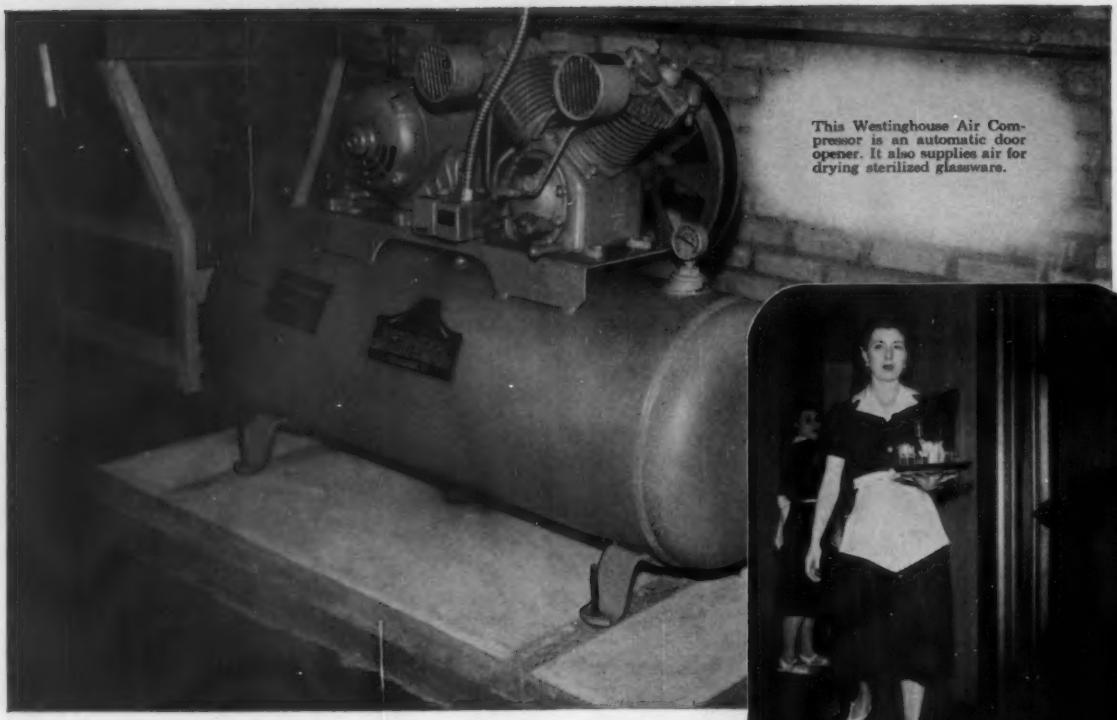

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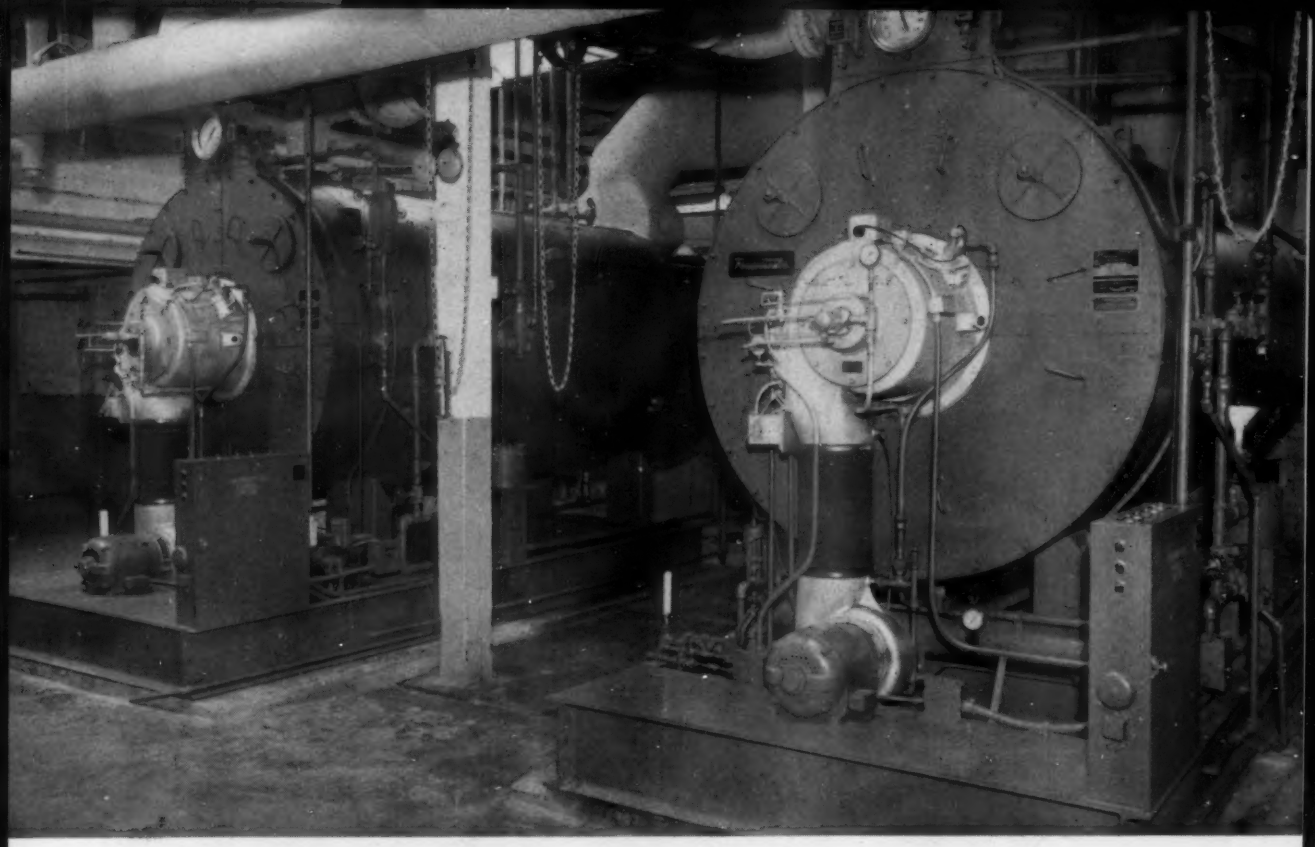

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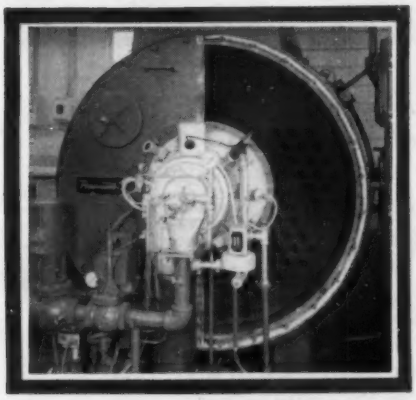

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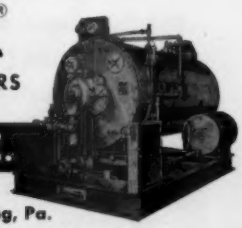

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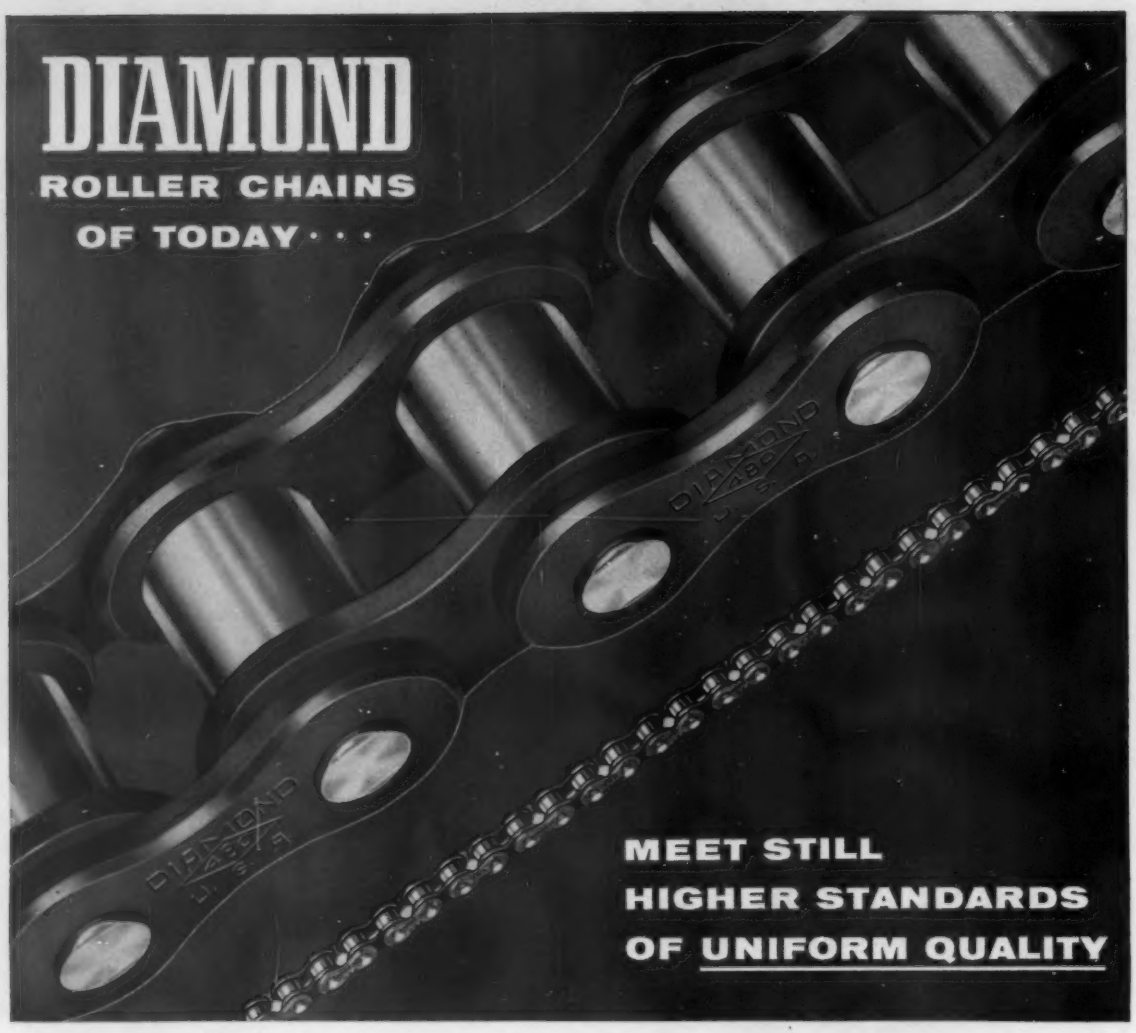

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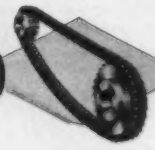

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Powell Lubricated Plug Valves

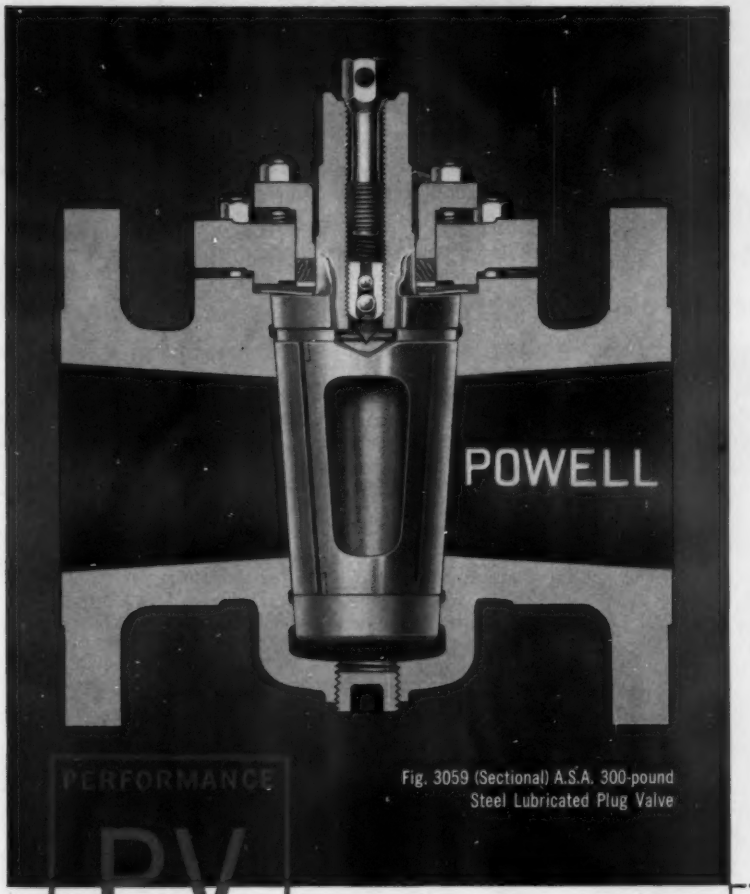

Fig. 3059 (Sectional) A.S.A. 300-pound Steel Lubricated Plug Valve

FIG. 1559G—150-pound Steel Lubricated Plug Valve. Gear operated

FIG. 2200—175-pound W.O.G. Semi-Steel Lubricated Plug Valve

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These specially balanced slings

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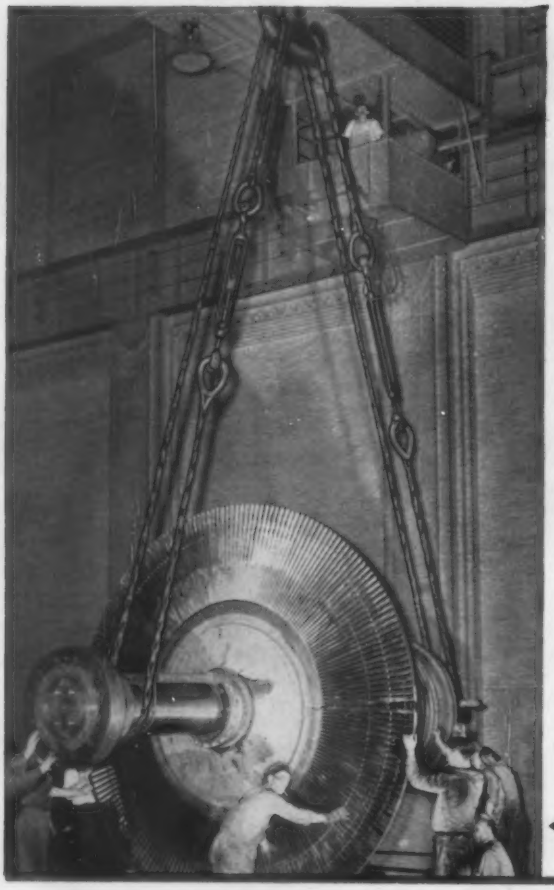

ATLAS slings are specially constructed to give you safe and easy handling of materials.

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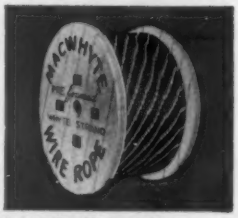

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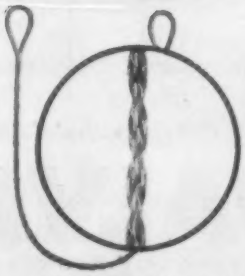

1. One right lay and one left lay wire rope are each spliced endless.
2. These ropes are hand-braided to form a round sling body.
3. All ropes in the body react in the same manner when loaded and each rope carries an equal share of the load.
4. These features produce a lightweight, flexible, kink-resisting sling that hugs the load for safe and economical handling.

10968

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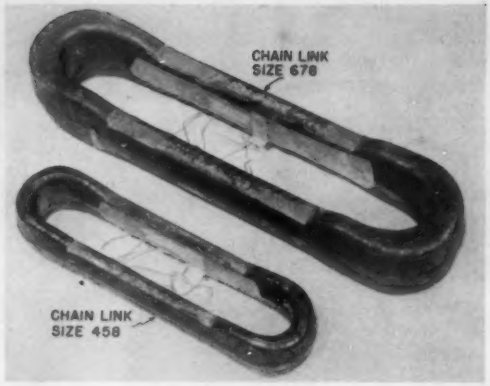


Fig. 1. After milling inside of each leg, precoat cement is applied. When dry, nitrocellulose cement is applied and strain gages embedded in cement. Weights are then attached to gages

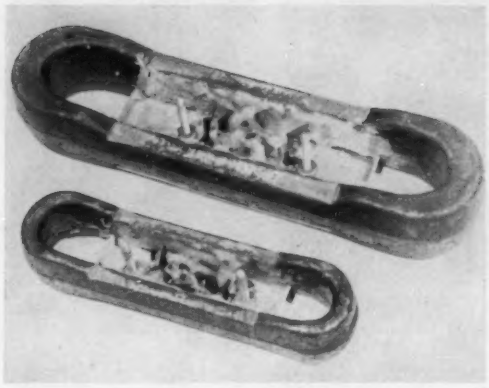


Fig. 2. After one hour, the weights are removed and the links are placed in an oven. When links are removed from the oven and before they cool, molten wax is applied over entire gage area

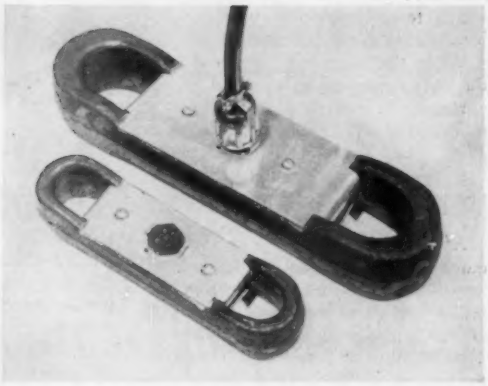


Fig. 3. Gages are then wired to the quick disconnect plug. Additional wax is liberally applied to entire gage, wire and plug area to form partial encapsulation against vibrational failures

Lab-on-Wheels Tests Conveyors

Provides On-the-Spot Check of Equipment at Checker Cab Co.

By A. SNIDERMAN, Director, Mobile Testing Laboratory, Detroit, Michigan

WITH THE present trend in industrial plants toward more and more automatic movement of material, conveyors are called upon to perform many additional tasks.

Conveyor lines which were previously only required to move material from one place to another are now asked to pick up material at a particular time and place, accelerate the material within limits, move at a specific speed to a second point and deposit the load at a certain place and time. Close synchronization of conveyors moving at different speeds is necessary to accomplish transfers of loads from operation to operation.

This new function of conveyors required a new approach in conveyor design. The Jervis B. Webb Co., a leader in conveyor engineering and manufacturing, early recognized that conveyors would require more precise operating characteristics in order to assure their satisfactory operation. One of the most important characteristics of a chain conveyor is the total load in the chain and the distribution of this load among the various components of the conveyor. In other words, how much of the total pull goes to conveying the load? To pulling the chain around a sprocket turn? To pulling the chain through a vertical turn using guide plates?

Lab Goes to the Plant

To determine the strength of a single chain link requires only that the link be taken to the laboratory and placed on a tensile testing machine. To check the pull in a complex conveyor installation is not as simple; you can't take the entire installation to the laboratory. Here is a problem where the laboratory must be brought to the conveyor.

At this point, the Jervis B. Webb Co. called in the Mobile Testing Laboratory of Detroit to perform such measurements. Essentially, there were two problems: first, a suitable dynamometer was needed as a measuring device; and second, an actual complex installation was needed where chain load characteristics could be measured.

For the dynamometer, it was decided to use a modified 678 chain center link with electric resistance strain gages as the transducers. Four strain gages were applied to the inside of each link in a complete Wheatstone bridge arrangement. Two of the gages were sensitive to tension in the link while the other two were sensitive to the transverse compression and provided thermal compensation. All gages were waterproofed and a quick disconnect plug was used on the link to provide for rapid disengagement from the measuring instrument as shown in Fig. 3. Changes in strain in the link were measured by a standard Baldwin SR-4 strain indicator.

The chain links were first milled on

the inside of each leg to remove the decarburized layer of metal and to provide a flat surface on which to mount the gage. Cleaning of the gage surface was done by hand with a solvent and then a final rinse with acetone. A precoat cement was applied to the entire gage area. When dry, a nitrocellulose SR-4 cement was applied and the gages were embedded in this cement in their proper positions. Weights were immediately applied to the gages to assure continuous contact with the base material and also to reduce cement layer thickness to a minimum. After one hour, the weights were removed and the links placed in an oven. The temperature of the oven was very gradually raised to 150 F which temperature was held for one hour to complete the cement process.

When the links were removed from the oven, and before they had an opportunity to cool, a 1/16-in. layer of molten wax was applied over the entire gage area. This was done to render the cement less susceptible to atmospheric moisture and hence improve stability of the calibration.

After wiring of the gages to the quick disconnect plug was completed, additional quantities of wax was liberally applied to the entire gage, wire and plug area to form a partial encapsulation for the purpose of rendering the wires immobile and hence less sensitive to vibrational failures.

Calibration of Test Links

In calibrating the links, they were mounted in the tensile testing machine by means of additional center links, side links and pins so that loads were applied to the test link in much the same manner as would be done in the actual conveyor, Fig. 4. A full range load of 10,000 lb was twice applied to the link before any reading was taken to eliminate any initial permanent set in the system. Calibration loads were applied in increasing increments as well as decreasing increments to eliminate hysteresis effects in the link and the testing machine.

After calibrating the links, static loads ranging from zero to 10,000 lb were applied in 1,000 lb increments and the strain gage output measured at each point. A calibration curve was thus prepared of the actual chain load in pounds against indicated strain in microinches per inch. This gave a calibrated, load sensitive link which could be installed in any conveyor using size 678 chains. A 458 link was also instrumented and calibrated to 5,000 lb as shown in Figs. 1 through 3.

The next problem was to find an operating conveyor of sufficient complexity so that load measurements made on it would yield useful information.

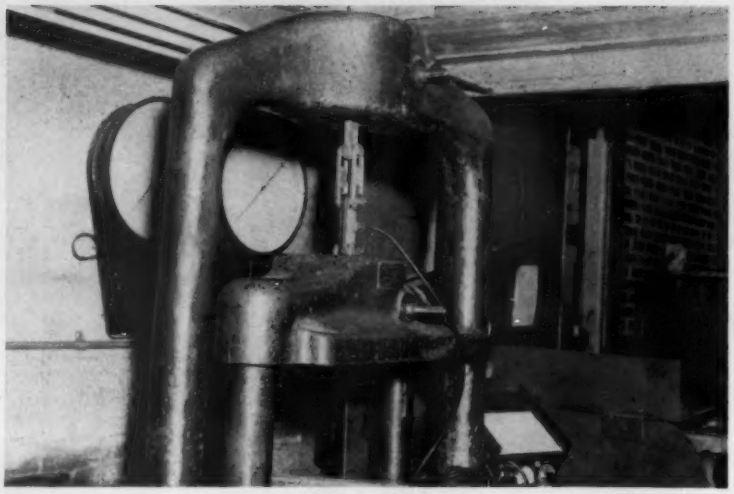


Fig. 4. After preparing test links, they are calibrated in tensile testing machine. Full range load of 10,000 lb is twice applied before the first reading is taken

Fortunately, the Jervis B. Webb Co. had just completed such an installation at the Checker Cab Manufacturing Co. in Kalamazoo, Michigan. Having just recently re-tooled for a new automotive vehicle, the Checker Cab Manufacturing Co. was interested in the performance of this new conveyor before the system was placed under full load. This conveyor picks up the chassis, body and engine assembly, mounted on a dolly, from another conveyor; lifts these to the second floor over an undercoating pit; makes a 180 degree turn into a washer and then transfers the dollies to another conveyor. All three conveyors move at different speeds.

Two test links were placed in this conveyor about 50 ft apart. This permitted double measurement of chain load at points of most interest. Loads were measured with the Baldwin SR-4 strain indicator. Being battery operated, the location of testing was not restricted by available power supply. A 35-ft cord connected the indicator to the test link with a quick disconnect plug at the link. The quick disconnect plug made it possible to switch back and forth between the two test links as well as allowing removal of the cord when structural interferences were encountered.

Loads were measured in the chain with the test link immediately before and immediately after each turn, bend or other guide, the difference being the loss necessary to traverse that particular component. Also, by placing specific loads on the conveyor between the two test links, it was possible to make "before" and "after" measurements of the load in the chain relative to the specific load.

The electrical power input to the drive motor was recorded during the test on a graphic wattmeter. The actual chain load and the conveyor speed gave the power output of the drive from which wrive efficiency was calculated.

Although the drive overload cut-out

About the Author

A. Sniderman graduated from Wayne University, College of Engineering in 1940 with a B.S. degree in Mechanical Engineering. Following graduation, he worked as an aircraft inspector for the U. S. Navy, Bureau of Aeronautics. In 1950, he took a position as senior mechanical engineer with the M. C. Manufacturing Co., Lake Orion, Michigan, where he designed and tested high pressure pneumatic relief valves.

In 1952, he moved to Hefco Laboratories, Detroit, as chief engineer. His responsibilities here consisted of setting up design, test and development programs for aircraft fuel filters, unconventional power packages, high pressure gear pumps. He also did research in the field of particle size measurements (0 to 60 micron range) and cooperated in the design of a wide face involute grinder.

In 1955, he organized the Mobile Testing Laboratory which operates in the general mechanical field of strain gage techniques to measure dynamic and static stresses, loads, pressures and accelerations; also sound and noise level analyses; pressure and leakage tests; and surface roughness measurements.

The mobile test unit consists of a panel truck which houses an optical comparator, sound level meters, strain gage transducers, amplifiers and indicators to test plant equipment.

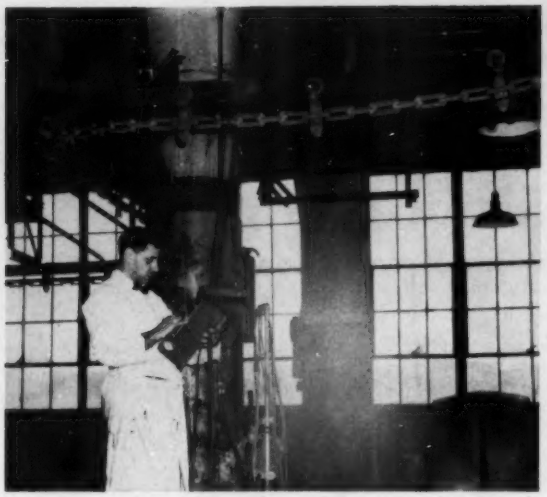


Fig. 5. Two test links were placed in conveyor at Checker plant. Loads were measured with a strain indicator

Fig. 6. Various chain loads were measured immediately before and immediately after each turn and bend in conveyor

device had been previously calibrated, this setting was checked. The test link was placed just ahead of the drive and the chain was locked with a wedge. Rotation of the drive by hand, loaded the chain until the overload switch was tripped at which point the actual load in the chain was determined.

These tests provided three useful items of information. First, it provided the Checker Cab Manufacturing Co. with performance data on their new conveyor. Second, the Jervis B. Webb Co. accumulated valuable data for use in the design of high performance conveyors. Third, it demonstrated how a mobile testing laboratory could be a useful tool for the plant engineer.

Considering a Hot Water Unit Heater System?

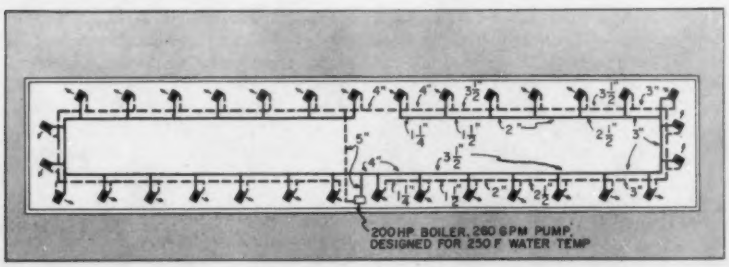
By WILLIAM W. GAYLORD, Consulting Engineer

HOT WATER as a heating medium has always had certain distinct advantages over steam but until relatively recently few, if any, unit heaters were available that could be economically used with this medium. Now that such units are readily available plant engineers designing a plant heating system should also consider the possible use of this type of system.

For the smaller systems a water temperature of 200 F with a temperature drop of 20 F between supply and return mains has usually been used. However, for plant work a higher water temperature with a larger temperature drop is more economical as it allows the use of smaller piping and circulating pump and requires much less power for the circulating pump.

An automatic control system, actuated by an outdoor thermostat, will, in most cases, be the only temperature control required. Such a system will vary the boiler water temperature to maintain a constant temperature in the building by controlling the operation of the burner on the boiler.

As an example of the use of such a system, take a building 150 ft wide by 800 ft long with 16-ft side walls and a flat roof. The side walls are glass for three-fourths of their height, the balance is 8 in. brick and the roof is insulated. The calculated heat loss from the building with an outside temperature of zero and an inside temperature of 70 is about 6,240,000 Btu per hour and is heated with 32 unit heaters of about 195,000 Btu each. See diagram.



Several examples mentioned in this article are based on a building 150 ft wide by 800 ft long with 16-ft side walls and a flat roof heated by 32 unit heaters

The estimated cost of a conventional low pressure steam system complete with boiler, oil burning system and condensation pump is about $32,200.

Estimated cost of a forced circulation hot water system using water at 200 F with a 20 degree temperature drop is about $34,300. This would use a 700-gpm pump operating against a 35 ft head and requiring a 10 hp motor with an estimated annual power consumption of about 34,000 kwhr.

Raising the water temperature to 220 F and the drop to 29 degrees reduces the estimated cost of the system to about $33,200. This would use a 400-gpm pump operating against a 25 ft head and requiring a 5 hp motor with an estimated annual power consumption of about 17,200 kwhr.

Raising the water temperature to 240 F and the drop to 48.4 degrees reduces the estimated cost of the system to about $32,000. This would use a 260-gpm pump operating against a 15 ft head and requiring a 2 hp motor with an estimated annual power consumption of about 7,000 kwhr.

From property record cards come punched cards ... From punched cards come annual inventories of equipment, list of machines which must be checked for accuracy, equipment replacement list, insurance evaluation data by department, plus preventive maintenance notices

Computers Rescue Maintenance Men!

Statistical Department Takes on Paperwork Load

IN MANY A PLANT, the maintenance engineer finds himself just another paper-burdened clerk, spending too much time worrying over inventory reports, updating maintenance records, filing new-parts requests.

But at Los Angeles' Northrop Aircraft, Inc., plant engineering has an electronic ally: computers who've taken over maintenance's paperwork.

Routinely, Northrop's computers:

(1) Take maintenance's inventory, supply a "missing" list of equipment strayed or stolen.

(2) Detail in-plant location of every tool and machine under maintenance's care.

(3) Print an equipment catalog . . . especially for plant engineering.

(4) Run insurance evaluation on all maintenance gear, segregated by department and plant.

(5) Tell maintenance department what needs maintenance, and when. This, probably the most dramatic preventive maintenance program by electronics in any plant, anywhere.

(6) Tell maintenance what machines need cycle tests (periodic checks for accuracy).

(7) Forecast long-range equipment replacement, with eye toward thwarting obsolescence in plant engineering stocks.

(8) Tell location of every scale, so maintenance workers can direct county weights-measure inspectors to the equipment.

All these varied reports emanate from but a single data sheet; what Northrop's Data Processing section calls the "Property Records Transcription Notice." The "Notice" is a single sheet which maintenance fills in for every machine, tool and gadget under its care. For every machine, Data Processing produces a punch card. And from this file—some 90,000 cards—come a dozen by-product reports. These reports are compiled within hours, instead of days as before, when maintenance processed its paperwork by hand.

The "Property Records Transcription Notice", required by Data Processing before it can punch cards, asks some routine questions: (1) machine's tag number; (2) who owns it (Northrop or the government); (3) its location . . . by department, area, level and bay; (4) description; (5) preventive maintenance code (when, routinely, should the machine be checked); (6) acquisition date; (7) original cost of the machine, including freight and installation charges.

From this write-up, which Maintenance hands Data Processing, comes, as we've said, some 90,000 punch cards. And from these an all but unbelievable number of by-product reports. Reports which once consumed more time than plant engineering likes to admit.

Let's take more careful look at the original data sheet—"Property Records Transcription Notice". For it is from this that Northrop's plant engineering department gets almost all of its data.

Once a card is punched with the "Notice's" detailed information, it's obvious that hundreds of reports can be gotten out, by computers. Why? Because 4000-6000 cards can be machine sorted and reports printed, every hour.

P.M. by Computer

Of the original 90,000 cards, only about 30,000, representing that many production machines, require routine preventive maintenance. Data Processing sorts the original deck, culls out the 30,000, reproduces them as a separate "preventive maintenance" file, the cards segregated by departments and by maintenance dates. That is, it tells whether a machine requires looking at monthly, every six months or annually. Routine "daily" maintenance is usually the job of the machinist himself, and is not Data Processing's concern in compiling the preventive maintenance report.

Originally, when maintenance filled in their "Notices", they'd merely indicated that such-and-such a machine required regular maintenance. Once these maintenance-necessary cards are culled, they're returned to plant engineering, where maintainers go into further detail. On a card's face, maintenance men note the maintenance frequency. Cards are returned to Data Processing, are punched with this more exacting information, and then filed.

A month prior to a machine's routine maintenance "come up" date, the 30,000 cards are sorted. Culled out are the cards—thus machines—due for maintenance. Tabulating machines print a "due" maintenance list—the list routed to plant engineering. Thus, without keeping monthly, six-monthly or annual routine records, plant engineering knows 30 days in advance specifically what machines it must check, their location and tag number. This compilation—run off monthly—requires but six hours of machine time.

Trial balance of equipment, their number and dollar value: In many plants, it's maintenance chore to compile annual inventories of equipment, and their dollar worth. At Northrop, the job's been released from Plant Engineering, assigned to electronic computers. Working from those 90,000 original data cards, a 1500-page equipment catalog is printed annually, listing every piece of equipment by name, location, and its dollar value.

Equipment Catalog: For some plants, the equipment catalog is a next-to-impossible chore. But at Northrop, with an index deck of 90,000 punch cards, annual equipment catalogs—a running inventory—is routine. Tabulating machines get out the catalog in precisely 40 hours (two men working sorting and tabulating machines). Plant Engineering has before it a list of every piece of equipment—from desks to gauges. And not only a physical inventory, but a locator quick-check record all in one.

Cycle Test List: Under every plant maintenance department fall a number of delicate machines which periodically must themselves be checked for accuracy. These are calibrating machines, gauges and the like. Every month, Data Processing sends Plant Engineering a detailed check-off list

(Continued on page 220)

Top photo on opposite page shows punch card which contains same information appearing on property record card held in back of it. Bottom photo shows typical punch card beside inventory sheet

PROPERTY RECORDS TRANSMITTAL

☐ ADDITION ☐ RETIREMT ☑ CORRECTION

☐ NAI ☐ USAF

NO.

	FROM	TO
CONTRACT/ACCOUNT NO:	072	
OWNERSHIP CODE:	12	
PROPERTY NO:	067325	
DASH		

STD. COMM. CODE: From> / To>

	TYPE	CAPACITY	MANUFACTURER
From>			
To>			

DESCRIPTION From> MOTOR DRILL

& INSTALL.: ▲ ▲

TION DATE: 2 48 (MO / YR) ▲ 70 ▲ 00 (MO / YR)

TABULATING:

PROPERTY RECORDS

ACCOUNT	TAG NUMBER	STANDARD COMMODITY CODE: TYPE	CAPACITY	MANUFACTURER	DESCRIPTION	LOCATION: FAC	SUFF	AREA	LEVEL	BAY	ISSUE DOCUMENT NO.	B.O. DATE: MO	DAY	YR	COUNT
4521	8695	4804713	5000		RACK STORAGE	XX	5819				6786	31	70		1
4522	219	3463121	100	1197600	HAMMER RIVET	XX	5819				6950	31	70		1
4522	492	346721		1197600	WRENCH IMPACT	XX	5819				6950	31	70		1
							5819				7836	42	70		1
							5819				6950	31	70		1
							5819				6950	31	70		1
							5819				7836	42	70		1
							5819				7836	42	70		1
							5819				6950	31	70		1
							5819				6950	31	70		1
							5819				13126	81	05		1
							5819				9887	8	55		1
							5819				9886	8	55		1
							5819				9887	8	55		1
							5819				9886	8	55		1
							5819				9887	8	55		1
							5819				9887	8	55		1
							5819				9887	8	55		1
							5819				9886	8	55		1
							5819				9886	8	55		1
							5819				13223	81	65		1
							5819				9886	8	55		1
							5819				9887	8	55		1
7282	67400	804720			BIN LINE STK	R1	5819	7411			9950	82	55		1
7288	67437	802252			DESK FLAT TOP	R1	5819				9886	8	55		1
7288	67438	802252			DESK FLAT TOP	R1	5819				9886	8	55		1
7288	67454	802252			DESK FLAT TOP	R1	5819				9886	8	55		1
7282	67505	4699711	100	9282400	STND ADJ HYD	R1	5819				9886	8	55		1
7282	67507	4699711	100	9282400	STND ADJ HYD	R1	5819	2711			9950	82	55		1
7282	67508	4699711	100	9282400	STND ADJ HYD	R1	5819				9886	8	55		1
7282	67511	3131228	900	9999900	UNIT POWER	R1	5819	8111			9950	82	55		1
7288	67512	399900		8163400	FUEL A PLANE	R1	5819				13223	81	65		1
7288	67576	4353131	100	1311800	TRAILER SEMI	R1	5819				9886	8	55		1
4035	67581	804722	9100		DESK FOREMAN										

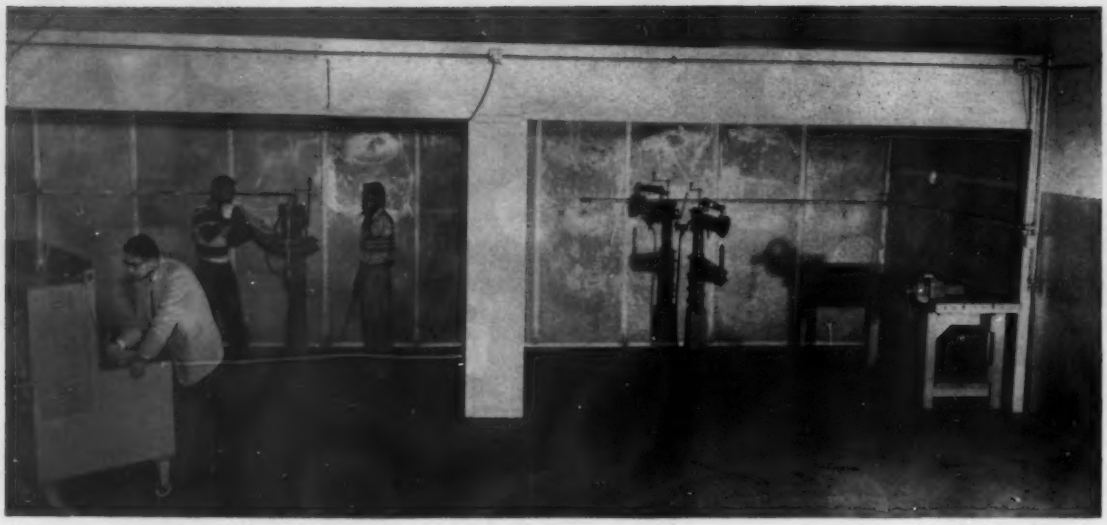


Fig. 1. These are the two complete booths, first installation at El Segundc for reducing noise from planishing hammers

Noise Reduction Comparisons —

What's Best for Isolation? Complete Booths Or Partitions Only?

By D. B. CALLAWAY, Manager, Western Dist., Industrial Sound Control Div., Koppers Co., Inc.

THERE HAVE BEEN numerous attempts in the past to reduce the noise of various types of production machinery by construction of partial enclosures or barriers around or near a machine. Reports on the effectiveness of such treatment vary considerably and actual measurements of the noise reduction they provide are seldom made. It will be the purpose of this article to discuss the capabilities and limitations of noise control structures of the partial enclosure type and to present the results of some field measurements in a particular installation at Douglas Aircraft Co., Inc., El Segundo Division.

Machines which lend themselves to installation of enclosures cover a wide variety of types. They include planishing hammers, automatic punch presses, small drop hammers, milling and grinding machines and many others.

Often a number of similar machines will be installed in proximity in the same manufacturing area. It is seldom possible to install any part of an enclosure between the operator and his machine because of the nature of the work performed on such machines. Instead, the enclosure is usually designed to accommodate the machine with its operator. With such an installation, large reduction in the noise which travels directly from a machine to its operator cannot be expected; the operator can be given considerable relief, however, from noise of other machines in the area. In addition, the general noise level in the entire area can be reduced.

Hearing loss due to noise exposure is a problem that has received a great deal of attention in recent years. Although data on noise levels which cause hearing impairment are far from complete at the present time, it is generally agreed that periodic relief from noise exposure to allow recovery of temporary hearing loss is an extremely important factor in preventing permanent damage.

Because of the intermittent nature of the work associated with punch presses, planishing hammers and similar machines, the operator of an individual machine would receive considerable rest between exposures if his machine and working position could be isolated from other machines in the area. With multiple installations, all operators are exposed to essentially the same noise level. For example, in the planishing hammer installation, to be discussed later, approximately 60 per cent of the hammers are in operation at any given time.

Noise reduction which is provided by partial enclosures is different at various locations with respect to the operating machine. Although, as stated previously, little reduction of the noise of his own machine can be provided the operator, considerable reduction inside adjoining enclosures or on opposite sides of noise-reducing barriers can be attained with proper design.

Noise reduction in the general area outside enclosures can also be appreciable but will vary according to the design of the enclosure and according to the location chosen for measurements. The noise reduction which partial enclosures can provide also depends on the frequency or pitch of the noise.

For low frequencies, where the wave length of sound in air is long compared to the dimensions of openings in an enclosure, noise travels around corners by diffraction and only small noise reduction can be achieved.

For low frequency noise, only a total enclosure will provide appreciable noise reduction. At higher frequencies, however, sound wave lengths are short and noise does not readily travel around corners or obstructions. Instead, high frequency noise can be made to travel in a beam similar to that of a flashlight. Sound shadows can thus be created in areas where maximum nioise reduction is desired.

This indicates that partial enclosures or noise-reducing barriers will be most effective for noises that consist mainly of high frequency energy.

Fortunately, this is the case with most of the machine types mentioned earlier. Furthermore, since it is generally agreed that high frequency noise is more damaging to hearing than low frequency noise, partial enclosures can be very helpful in reducing the chance of hearing damage.

The machines for which a noise control installation was designed and evaluated were a group of twelve planishing hammers in a large reverberant manufacturing area. The hammers were located along the walls of the area and were spaced from 10 to 12 ft apart. The noise due to planishing hammer operation is among the most intense which can be found in metal production areas. A graph of the noise levels at the operators position for a typical planishing hammer operating on an aluminum sheet is shown in Fig. 3.

Big Improvement Possible

Sound levels in decibels are plotted for frequency ranges shown along the horizontal scale. Most of the noise occurs in the high frequency bands with a maximum level of 126 decibels (db) in the 2400 to 4800 cycles per second (cps) range. With a noise such as this, which is certainly in the range which can cause hearing damage, considerable improvement can be expected by the installation of properly designed enclosures.

For the first part of the installation two hammers located side by side in one bay of the manufacturing area were chosen for treatment. Booths with open fronts having acoustically treated walls and ceilings were installed around each of the hammers. The materials used for booth construction were Soundmetal Panels of perforated sheet metal filled with acoustically-absorbent blanket. The panels were 3½ in. thick and had a noise reduction coefficient (the average of the sound absorption coefficients for the most important part of audible frequency range) of 0.95. This means that on the average, 95 per cent of the noise energy incident on the panels is absorbed rather than reflected. Panels used for separating the two booths had an internal septum of heavy gauge sheet metal to reduce passage of sound from booth to booth through the separator panel. All of the remaining panels had solid sheet metal outside faces to reduce escape of noise from the booth. Complete evaluation tests of these two booths, which can be seen in Fig. 1, were performed. Sound measurements were under way at the time the photograph was taken and the sound measuring equipment can be seen at the left.

After evaluation of this installation it was decided to see how much noise reduction would be provided by a less expensive treatment. For the remaining ten booths in the area, Soundmetal Panels were used to fabricate portable partitions which could be rolled into place between planishing hammer stations. These panels measured 8 ft square and were 3½ in. thick. To prevent noise transmission through the panels, internal solid septum sheets were incorporated.

While this installation was considerably less expensive and had the advantage of greater production flexibility, it was anticipated that the portable partitions would provide considerably less noise reduction than the booths described earlier. A photograph of the portable partitions with sound measurements under way is shown in Fig. 2.

Noise measurements were made at three locations for the enclosed booths as well as for the portable partitions: (1) the operator's position with the hammer in operation; (2) the operator's position in the booth adjacent to the operating hammer; and (3) a location in the manufacturing area 10 ft directly in front of the operating hammer.

In all cases the noise reduction was determined in octave bands which covered the audible frequency range between 37.5 and 9600 cps. Calibrated sound-measuring equipment of good quality was used. A standard aluminum aircraft part was used in all the tests to assure that the noise source remained constant. Noise reduction for each octave band was determined by obtaining the difference in decibels in each band with and without the silencing treatment installed.

Figure 4 compares the noise reduction for the partitions only with the noise reduction for the complete booth as measured at the location of the operating hammer. While the portable partitions provided little or no noise reduction for the operator, the complete booth gave reductions ranging from 4 to 11 db throughout the frequency range.

It should be pointed out that reductions of this magnitude cannot always be counted on for the machine operator. In this particular case there appear to be two related reasons why significant reductions were obtained. First, before installation, the manufacturing area had no acoustical treatment and was extremely reverberant, so that a great deal of noise returned to the operator after being reflected from room surfaces. Second, planishing hammer noise consists of impacts occurring at a rate of approximately 25 to 50 beats per second.

Addition of the acoustical treatment causes the sound from the individual impacts to decay more rapidly, thus reducing average levels of the noise as measured by the sound level meter.

Figure 5 shows the noise reduction for the complete booth and for the portable partitions at the location of

Fig. 2. Providing considerably less noise reduction than did the complete booths these partitions were, at the same time, less expensive and were readily portable

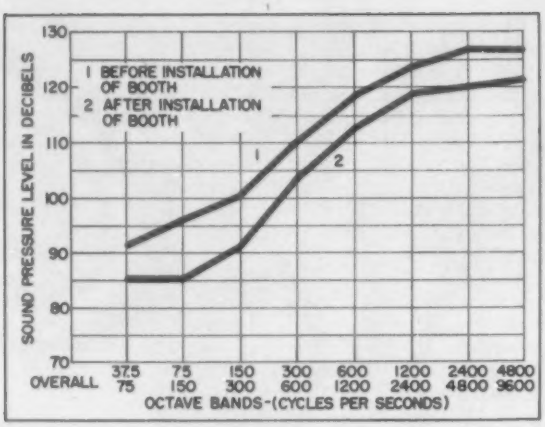


Fig. 3. Noise level developed at hammer operator's position

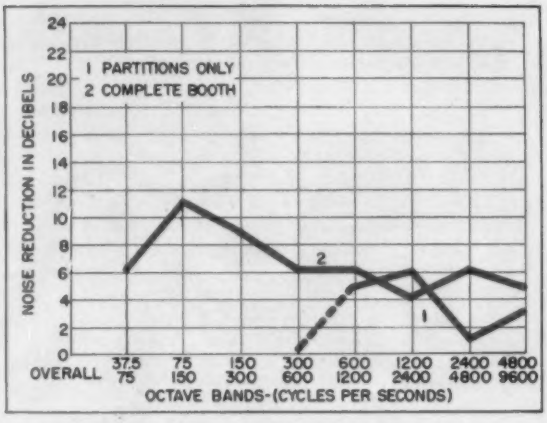


Fig 4. Noise reduction, in decibels, at the operator's position

an operator adjacent to the operating hammer. While the portable partitions give sizable reductions, ranging as high as 9 db in the middle frequency ranges, the complete booth is much more effective for noise reduction at this location. With the complete booth a reduction of 16 db or greater was achieved for all octave bands above 150 cps.

Figure 6 compares the reductions at locations 10 ft in front of the operating hammer, of the portable partitions with the reductions of the complete booth. The reductions due to the portable partitions were very small but the noise reduction provided by the complete booth was 5 db or more for frequencies above 300 cps. Noise reductions measured at various locations check reasonably well with those predicted before installation.

Now, how about the significance of reductions of these magnitudes in connection with potential damage to hearing, interference with speech communication, and effects on employee comfort and morale? A precise discussion of these factors would be lengthy and is, to some degree, impossible because of lack of complete information on the relationship between physical properties of noise and its effect on people. Certain observations can be made, however, which will indicate the value of the noise reduction which was achieved.

With regard to noise-induced hearing loss, there are sufficient data now available to indicate that steady noise of levels such as those which exist near planishing hammers is certain to cause eventual hearing loss. It is also known that for a given noise level, high frequency noise is more damaging than low frequency noise. Since planishing hammer noise consists predominantly of high frequencies, the noise reduction provided at high frequencies is of most concern in these installations.

A study of the data indicates that for both the booths and the partitions the noise reduction was greatest at high frequencies. A second significant factor in connection with noise-induced hearing loss, is the amount of relief or recovery time which exists between noise exposures. Because the planishing hammers are operated intermittently, partial enclosures are especially worthwhile in providing greatly reduced noise levels for personnel during periods when their own hammers are not in operation.

As in the case of hearing loss, high frequency noise results in serious interference with speech. Before installation of the booths, it was virtually impossible to converse anywhere in the vicinity of an operating hammer. After installation of the complete booths, however, communication by shouting was possible in areas in front of the booth while conversation in the booth adjoining the one containing the operating hammer was quite easy. This has a definite effect on safety and may well improve morale and lessen fatigue.

Considerable discussion of the loudness of noise has appeared in the literature in recent years and methods for calculating loudness and loudness reduction from octave band measurements have been proposed. Actually, in dealing with noise levels as high as those associated with planishing hammers the concept of loudness has little

(Continued on page 222)

Fig. 5. Noise reduction, in decibels, at the adjoining hammer

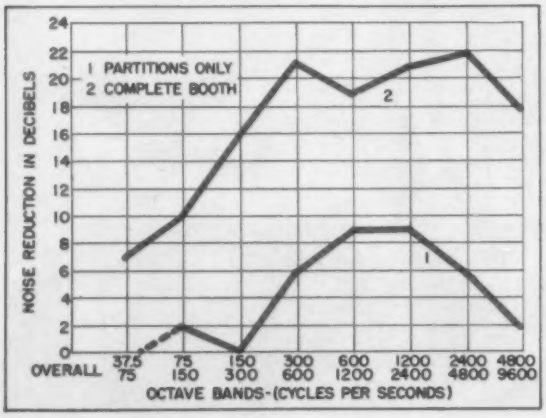
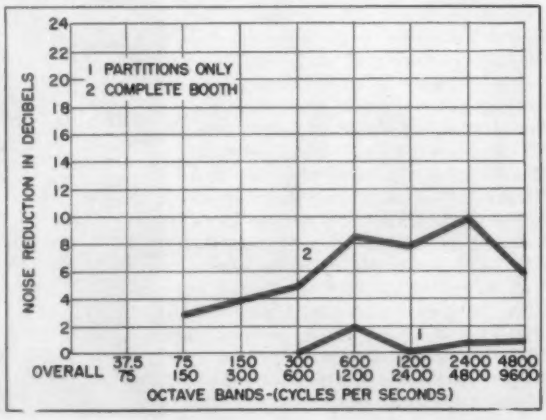


Fig. 6. Noise reduction evidenced 10 ft in front of hammer



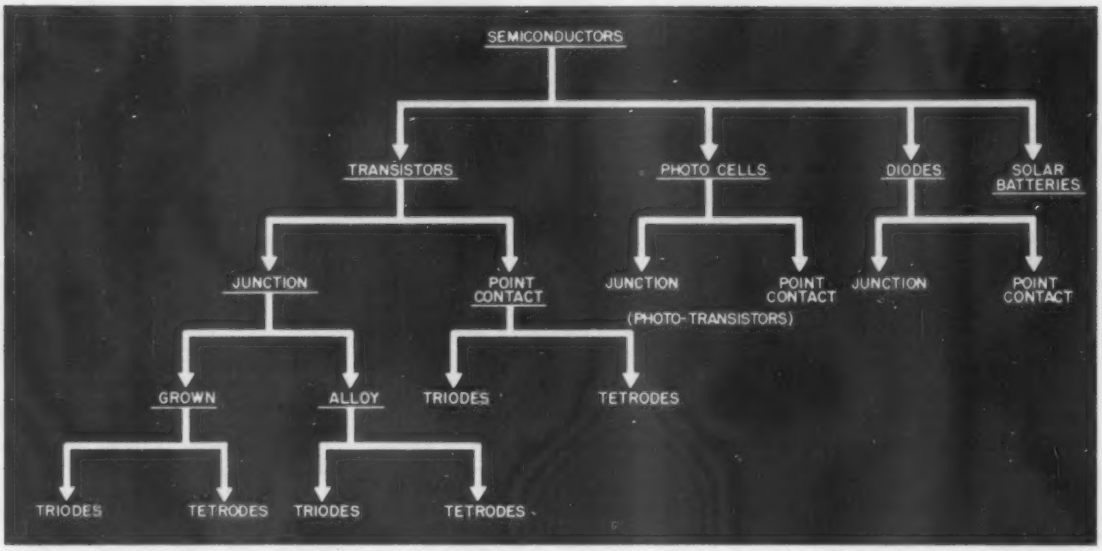


Fig. 1. Simplified classification of commercial semi-conductors. Actually, there is a much greater variety of structures, fabrication techniques and materials but this variety would show up only in a much more detailed classification

Transistors in Industry—
Where They Fit in the Control System's Nerve Center

By H. E. MARROWS, Western Electric Co., New York City

PRODUCTION TIME tables reflect capabilities of machines. In order to set up high speed time tables a great deal of information on machine characteristics must be gathered. The rapid growth of the instrument industry reflects the intensity of this information gathering. Great strides have been made in developing new components for measuring and transmitting information, and it appears that transistors and related semiconductor devices bid to become the most important components of information networks, the nerve system of industrial controls.

Present transistors have relatively low power handling capability, but this is no great disadvantage because information processing, using transistors, generally requires power in the microwatt levels in some cases and milliwatt levels in others. That is why they hold so much promise for telephone applications. The transmission of information is the "product" of telephone companies. It seems almost appropriate that transistors came from the inventiveness at the Bell Telephone Laboratories.

The term "transistor" was coined by the Bell Laboratories and the invention was announced in 1948. The Western Electric Company, manufacturing arm of the Bell Telephone System, began manufacturing transistors in 1951 and in early 1952 disclosed its technology to others in an 8-day symposium of lectures with plant and laboratory visitations. This led to the establishment of many different centers of initiative and engineering development work, to the extent that production and use of transistors in 1954 totaled about 1,500,000, an amazing increase.

In six years the word transistor has become a household term, with over 15 companies advertising almost 200 different model designations. Prices of transistors, in small quantities, run from $2.50 to $45.00.

However, the technical aspects as well as possible applications of this new device are not too well known to engineers in industry, although their interest has been aroused. The purpose of this article is to give a brief summary of some important developments which have taken place during the past several years and which hold great promise for industrial information applications.

There are three basic classes of transistors which are commercially advertised today: the point-contact, the junction, and the phototransistor. A simplified classification of commercial semiconductors is shown in Fig. 1. A more detailed classification of semiconductors would show a variety of structures, fabrication techniques and materials. For example, a further subclassification of the grown junction transistor could have been made listing germanium and silicon types. However, only one company has announced the commercial availability of the silicon type transistor. All other commercial transistor classifications, at present, are the germanium type, while diodes are made of silicon, germanium, selenium, copper oxide, and silicon carbide. Solar batteries are made of silicon.

The terms triode and tetrode in the chart mean three or four elements, respectively—the same as the terms used for electron tubes. The phototransistors are triodes, if the impinging light mechanism is considered as an element. Physically, they are diodes (two elements) and would act as such if they were encased in a light-tight container.

Understanding Transistors

Study and use of unusual conductivity materials goes back many years. Thermistor (temperature sensitive) and varistor (voltage sensitive) devices are now widely used in electronic equipments. Studies of the materials used in the latter led to the invention of the transistor, and to its development by the Bell Telephone Laboratories. As is fairly well known by now, the transistor is a high efficiency device requiring no filament power or warm-up time, is small and has an extremely long life.

With appropriate low power sources, the transistor can act as a

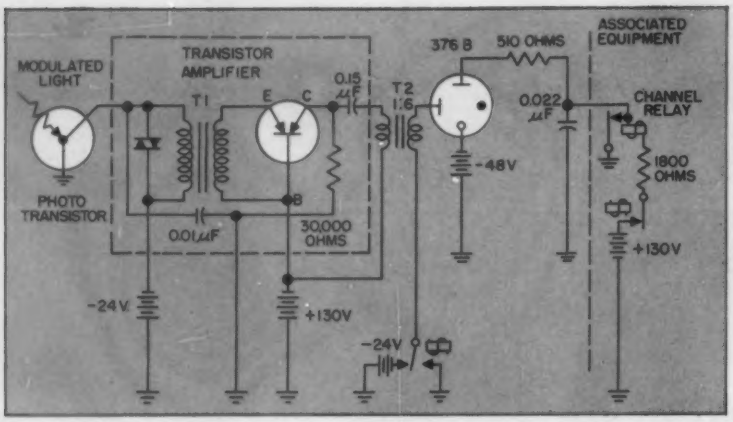


Fig. 2. Electrical section of channel circuit in 4A Toll Crossbar Switching System

valve to control current. It can amplify, oscillate, or function as a switch. The transistor is especially suited to applications where low level signals are involved, where high frequency signals prevail, where low power consumption and compactness along with efficiency are important, and where long life and reliability are essential.

At the present time, commercial transistors cannot displace other devices where relatively high power output is required, or where temperature extremes are encountered. With these thoughts in mind, this article will discuss how transistors will play an important part in industrial information networks.

Information Networks

It is easy to bring to one's mind a picture of how salient industrial activities are associated with information gathering, information transmission and information control. This picture would probably go beyond the usual industrial engineers chart normally limited to processes and production machinery, and would include inventory and accounting activities.[1]

A little reflection will bring out the importance of an information network in an industrial plant. Conference, reports, interdepartment memorandums, etc., consume time and energy—of the highest priced talent. We have become so specialized in measuring, processing, inspecting that sometimes technicians cannot grasp implications of their own work. Perhaps no single individual can visualize or comprehend the overall system of an industrial works without special aids, and this is where planned information networks do a good job. Management needs a picture of the whole system available at all times, and to do this, information must be gathered, transmitted, analyzed and displayed or recorded in appropriate form.

Just as production machinery has been integrated into larger, more complex as well as speedier units, the pattern of information gathering is changing also. The era of the simple indicating instrument is rapidly drawing to a close. With high speed machines elaborate control systems transmit errors signals constantly and rapidly, requiring quick response records to show what happened.

To simplify our discussion, we can consider an industrial information network as consisting of the following elements: 1. Sensing devices, 2. Amplifiers, 3. Transmission devices, and 4. Output devices for control and recording. Of the many transistor developments which appear in the literature, only a few in each of the above categories will be discussed in general terms for the purpose at hand.

One of the most specialized industries, the instrument field, produces sensing devices of many varieties to detect changes in temperature, pressure, displacement, torque and other variables encountered in industrial processes. One of the reasons for the great variety of types is the wide range of physical requirements with different applications. Either the element itself or its associated components are just too large or their physical shape is not adaptable to a variety of jobs. As a sensing element is made smaller, with fewer associated components, and as it is made more versatile, it can be more universally used. Transistor devices certainly show much promise in this respect.

Inviting uses of transistor sensing devices in high speed supervision of process variables are possible in places where excessive vibration, noise or some other indication will foretell trouble.[2] Such a system using transistors can be extremely small, rugged and relatively inexpensive for the purpose; and it can be used in places where it would be impractical to use any other type of device. For example, a temperature monitoring system employing 40 thermistors and transistors, used in turbine areas of U. S. Naval vessels, warns of critical temperatures in bearings and sounds alarms with signal lights to indicate trouble areas. Thermistors are embedded in the bearings and the complete transistorized system draws less than 30 watts input power.[3]

Phototransistors

Where light can be utilized as a sensing medium phototransistors offer advantages over other similar devices. Phototransistors can give a signal of continuously variable output current as a function of variable light input. Some operate on the order of 1 to 5 microamps of current, 1 to 4 millilumen of light with an output of 2 to 15 volts. Figure 2 shows a typical circuit in the Bell Telephone 4A Toll Crossbar Switching System.[4]

In the use of sensing devices it is often desirable to have carrier power available for magnetic amplifiers or bridges. Figure 3 shows the requirements which led to the development of one experimental oscillator by the Bell Telephone Laboratories.[5] It emphasizes the simplicity and low power drain a transistor device can show.

Fig. 3. Requirements that led to development of one experimental oscillator

1. Battery supply voltage: Nominal 6v.; 12v. optional. Range +6% to —13%; 2. Max. power drain from battery: Power drain averaged over operating life not to exceed 35 milliwatts; Frequency of oscillation: Single frequency of 130 cps.; 4. Frequency drift: ± 7% over total life; 5. Output voltage: 8.5 v. rms. at nominal battery voltage with 20% permissible distortion across an 11,000 ohm resistance; 6. Output impedance: To be determined by power transfer considerations at the fundamental frequency. 7. Stability: A variation of rms output voltage of the same percentage as the battery voltage over useful life of the battery is permitted.

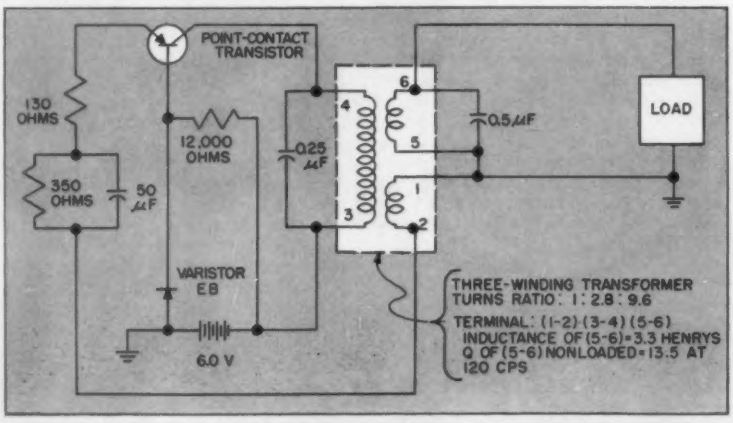


Table I. The properties of commercial transistors give some idea of the circuit possibilities which they possess

1. Low noise figure—10-20 db at 1000 cps.
2. Complete freedom from short-circuit instability. The input and output impedances are always positive regardless of circuit choices. This allows for a variety of circuit design and it is possible to obtain a multitude of combinations of input and output impedances. (Due to new types of transistors now in a development stage, this generalization may have to be qualified in the future.)
3. High power gains in the order of 30 to 40 db per stage.
4. Power dissipation to two watts and more with very high efficiency.
5. Withstand shocks of 20,000 g and vibration tests of 100 g in the audio frequency range cause no measurable microphonic noise.
6. Frequency response to 30 megacycles.
7. Exceedingly small power consumption.

(Note: While these properties are obtainable separately in various junction units, they are not all obtainable in a single type)

Although present germanium transistors have relatively narrow operating ranges in temperature, they themselves offer new possibilities in temperature compensation.[6] Consider the semiconductor devices called thermistors (thermal resistors). They utilize the phenomena of increased electrical conductivity with increase in temperature for compensation purposes. They are made from mixtures of metallic oxides and are widely used in communications. For example, in the Bell Telephone System upwards of fifty different thermistors have been coded and over ten million units are now in operation. Some of the applications include automatic volume regulators on carrier systems, surge eliminators in PBX stations, temperature compensators and temperature regulators.

However, commercial thermistors are available only with negative temperature coefficient of resistance. Sometimes, in the use of sensing or other devices, a positive temperature coefficient thermistor would be very useful. This can be had by using a transistor to invert and enhance the negative characteristic of a commercial thermistor. (See Fig. 4). It is also possible to make an adjustable thermistor from a transistor. (See Fig. 5). In addition to the adjustability, this "transistor-thermistor" has a higher incremental resistance for a given compensating current than does a commercial thermistor.

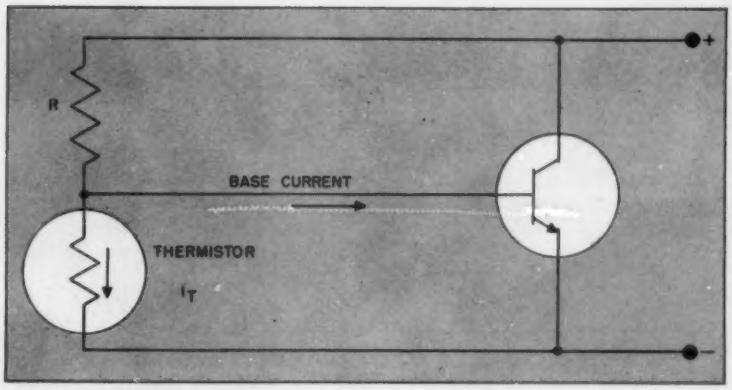


Fig. 4. Positive-temperature-coefficient thermistor-amplifier using a transistor

The themistor current detracts from the transistor base current in such a way that all transistor currents diminish with rising temperature. This, in turn, produces a rise in emitter resistance which further enhances the current decrease so that resultant temperature coefficient is not only reversed but also larger than that of thermistor T. Characteristics such as these are sometimes useful in the design of sensing devices.

Another interesting possibility for sensing element networks is the insertion of transistors as active components in a normall passive network to achieve certain desirable effects such as reduction of dissipation, elimination of inductance, production of delay, or inversion of impedance.[7]

Because sensing elements often require some sort of bias, techniques associated with junction diodes should be of interest. With junction diodes it is possible to control bias with temperature, to provide a source of regulator or reference voltage, or to provide a simple source of bias voltage.[8] (See Fig. 6 and 7.)

Generally, sensing elements require amplifiers. A few years ago, Wallace and Pietenpol[9] of the Bell Laboratories summarized the outstanding properties of the junction transistor and Table I shows some properties of recent commercial transistors and gives some idea of circuit possibilities. Data for an experimental amplifier developed by the Bell Laboratories is shown in Fig. 8.[10] This is a schematic of this simple amplifier, with no temperature compensation. Many other amplifiers may be found in the literature.

Transmission of information from one point to another by transistors offers new approaches not previously considered economical or practical. A transistorized light beam transmission system could be useful in some industries. Small units have been built with transistors that have worked well for 100 ft without any external antenna.[11] Instead of radio waves, the light beams used are shorter, therefore can be more easily beamed. This makes for more secrecy, better efficiency, less radiation interference with other instruments and signalling devices.

Of course, radio transmitters, either AM or FM, will also be of great interest in transmitting information. Figure 9 is an example of an experimental FM transmitter developed by the Bell Telephone Laboratories.[12] This unit takes up only 3½ cu. in., including the power supply. A single transistor performs all the functions required of a complete FM transmitter. It has only eight other elements and a battery in the circuit. Figure 10 is the preamplifier with a microphone which was used with the transmitter in a public address system. A receiver picked up the FM signal and fed the signal to a standard public address system. The audience was totally unaware that the microphone was not attached to the customary cables. Figure 11 is a schematic of the complete transmitter.

Previously, it was pointed out that a transistor could be a contributory active element of a sensing network. Similar use can be made of transistors in transmission lines to reduce attenuation.[13]

Associated with transmission de-

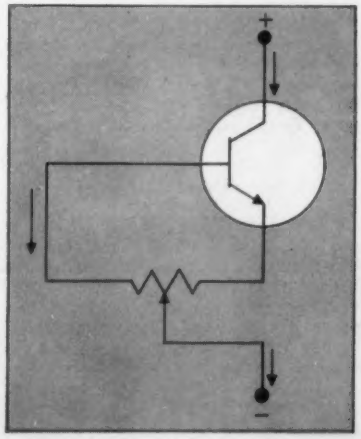


Fig. 5. An adjustable thermistor using a transistor. In addition to adjustability it has a higher incremental resistance for a given compensating current than does a commercial thermistor

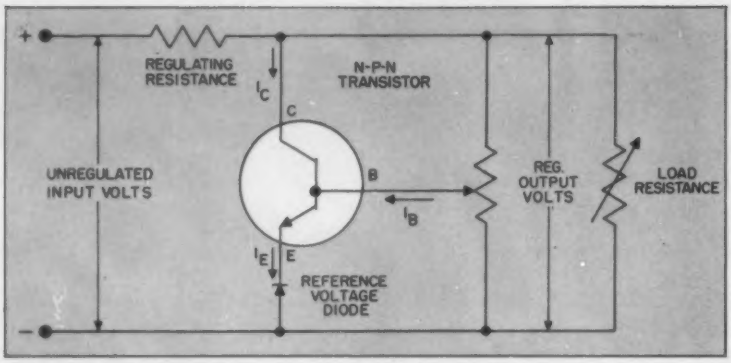


Fig. 6. Simple transistor shunt regulator. With junction diodes it is possible to provide a source of regulator or reference voltage, or source of bias voltage

vices are output devices. Here we are concerned with detection, switching, timing, counting, controlling, recording, storage of information, and related activities for feedback and control.

Switching signals to actuate controls are of great interest to every industrial engineer. Transistors can play a good role here within their power limits. In addition, junction transistors can perform switching functions that cannot be done by any other known electronic device.[14] For example, a junction transistor can possess unique properties when used as a non-regenerative switch; that is, a switch which can be maintained in an altered condition only by the continued application of an adequate signal or stimulus. In "off" condition, it can save many megohms impedance, while in the "on" condition show less than an ohm impedance. And these non-regenerative switches can be switched in as little as a tenth of a microsecond. Also, the ratio of power necessary to activate the switch to power controlled can be several thousand.

Another possible future application is to use a single transistor as a reversible rectifier or a frequency changer, features not possessed by any other known device.[15] However, transistors of somewhat higher power handling capability will have to be manufactured for practical industrial applications.

Versatile

In addition to new things transistors can do, it has been demonstrated by the Bell Laboratories that transistors and other semiconductor devices can perform completely all of the functions ordinarily required of vacuum tube circuits in a data handling system of considerable complexity.[16] This system is a six digit position encoder and serial-output digital register and can perform functions of photo-electric encoding, pulse regeneration, digital storage, reflected-to-natural binary translation, and digit shifting by means of circuits using transistors and other semiconductor devices. A model of this machine occupies a volume of about ¼ cu ft, weighs 7 lb and consumes only 16 watts of power.

Only some highlights of recent transistor application progress have been presented in this article. Developments on transistors and circuits have been multitudinous in the last year. When this atricle was started a few months ago, coded commercial transistor types numbered about 110. When the article was completed, this figure had reached over 200.

It is hoped that we do not give an impression of miracles to come overnight. A great deal of development work is going on to meet many of the required needs of industry. New application designs can hardly be expected of industrial technicians. This work

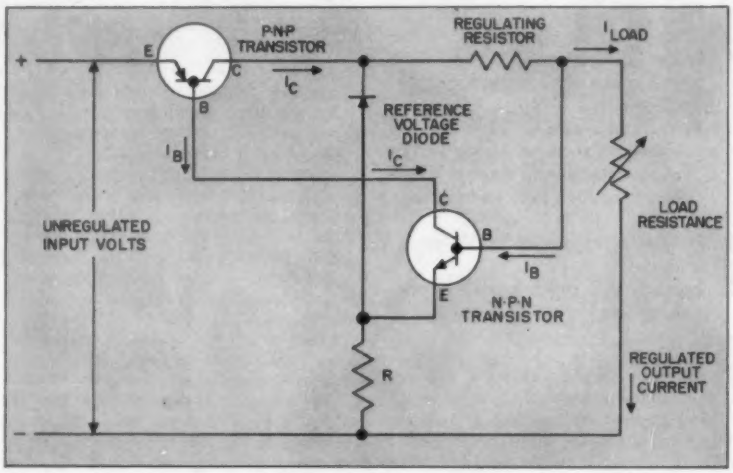


Fig. 7. This shows a transistor series regulator for constant current regulation

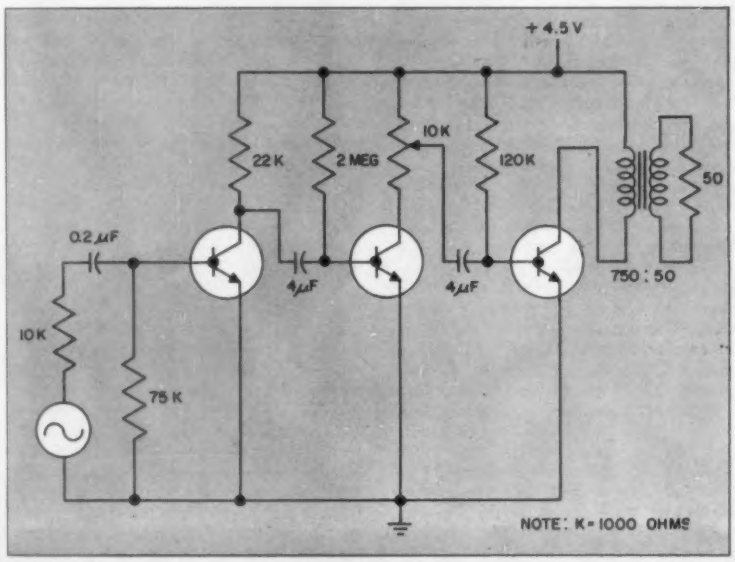


Fig. 8. Schematic of audio transistor amplifier. Characteristics shown below

Input impedance: 10,000 ohms; Output impedance: 50 ohms; Available power gain over audio range: about 90 db; Voltage gain between impedances specified above: 60 db; Power supply voltage: +4.5 volts dc; With source replaced by 10,000 ohm resistor, noise voltage: 0.0028 volts; Noise power: 0.16 microwatts; Noise figure: about 5 db; Maximum power output for sinusoidal signals: 2mw; Type of circuit: 3 resistance—capacitance —coupled grounded emitter transistor amplifier stages. Schematic diagram shows no temperature compensation.

will probably be accomplished by transistor research and circuit design engineers, with the help of those who can use them. Every technician should fortify himself with some knowledge of the capabilities of transistors and call on circuit design engineers for help in specific applications. The companies manufacturing transistors are eager for such inquiries and will gladly cooperate for specific applications.

We wish to acknowledge the aid and criticism of many individuals in the Western Electric Company and the Bell Telephone Laboratories in preparing this article.

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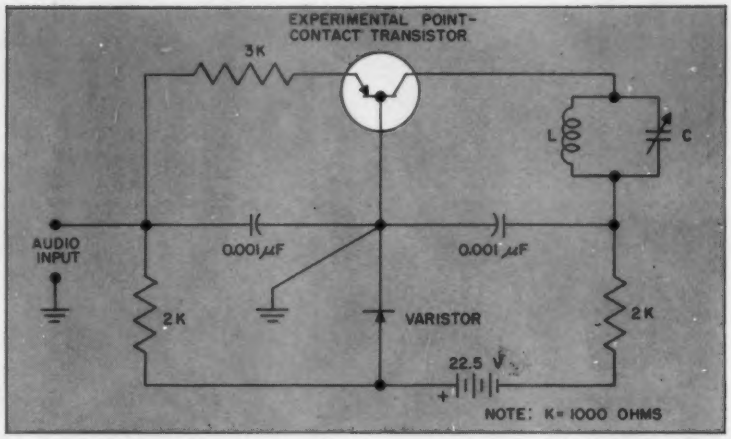


Fig. 9. An experimental FM transmitter developed by Bell Telephone Laboratories. This tiny unit takes up only 3½ cu in., including the power supply

SOME TRANSISTOR CIRCUITS AND APPLICATIONS

Commercially Manufactured and Advertised for Sale or Lease

1. Amplifiers for telephone applications
2. Amplifier—mixers for radio broadcasting and recording
3. Hearing aids
4. Personal radios
5. Signal generators (400 and 1000 cycle)
6. 400 and 500 cycle frequency standards
7. Geiger counters
8. Paging systems
9. Subminiature high voltage supplies
10. Transistor analyzer
11. Preamplifier for oscilloscope
12. Phonographs
13. Power-line carrier communication equipment
14. Anti-repeat control unit
15. Transistorized units: Audio amplifiers; Audio preamplifiers; I-F amplifiers; D-C amplifiers; R-F oscillators; Photo amplifiers; Audio oscillators; Transistor controlled magnetic amplifiers; Power amplifiers (3 watts); Plug-in functional units for computer circuits; Servo amplifiers.

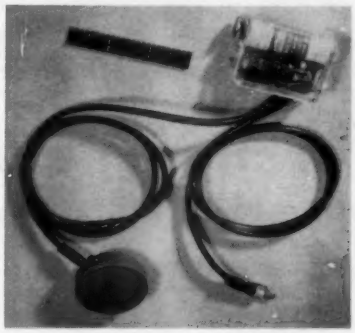


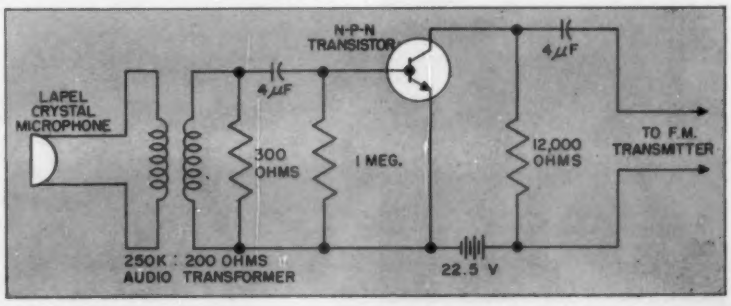
Fig. 10. This is the preamplifier used with the unit in Fig. 9 in p.a. system

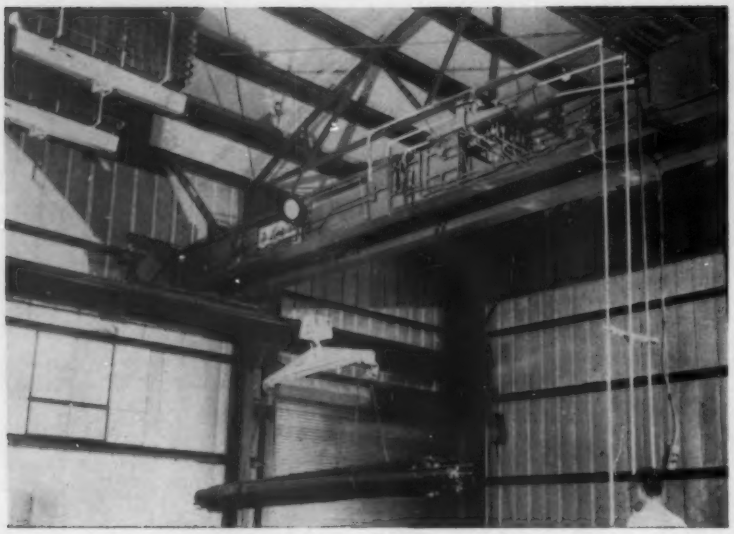
All-Electronic Switching System

The world's first electronic telephone exchange—forerunner of a radically improved and faster means of routing telephone calls—will go into experimental operation in Morris, Ill., in the next few years, it was announced recently by Illinois Bell Telephone Company on behalf of Bell Telephone Laboratories.

Relays now used in dial switching systems operate in about one-thousandth of a second, but the elements in the new system are expected to operate a thousand times as fast—in a millionth of a second. A key part of the new system will be the transistor.

Fig. 11. This is a schematic diagram of the preamplifier shown in Figure 10





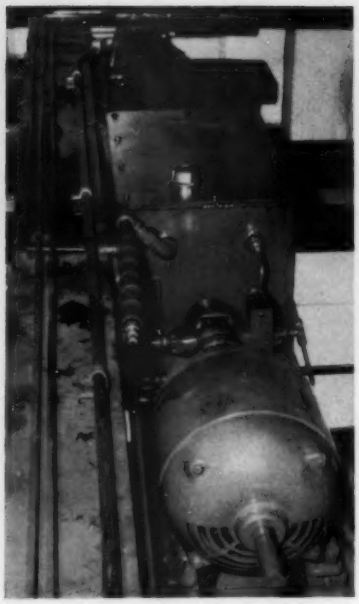


Fig. 1, above. Crane spans 37 ft and has three-ton capacity. Pendulum controls bring about hydraulic valve operation of bridge, trolley, hoist. Fig. 2, right. Single-speed, 10 hp squirrel-cage motor drives central vane-type hydraulic pump

Crane Operates on Hydraulic Power

One Motor-Pump Unit Serves Bridge, Hoist and Trolley

COMPLETELY HYDRAULIC, three-ton overhead traveling crane, reported to be the first ever built, has been designed and constructed as an experimental model by the Shaw-Box Crane & Hoist Division of Manning, Maxwell & Moore, Inc., Muskegon, Michigan. This crane has been operating for several months in a local plant requiring average industrial crane service. While this crane is controlled from the floor, it may be equipped with the usual operator's cage.

One apparent advantage of this all-hydraulic crane is that it provides infinite variable speed under any load.

Fig. 3. Hoist, cable setup from below

Engineers of the Division have designs completed for cranes up to and including 10-ton capacity, which range covers between 65 and 70 per cent of the cranes purchased. Whether or not designs will be developed for cranes over 10 tons capacity is dependent upon the reception of the all-hydraulic crane by industry.

Power for each of the crane motions, hoist, trolley travel and bridge travel is supplied by a single Dudco constant delivery, vane-type hydraulic pump driven by a 10 hp squirrel-cage type single-speed motor. The pump has a capacity of 12 gpm and provides 2000 psi at 1200 rpm, Fig. 2.

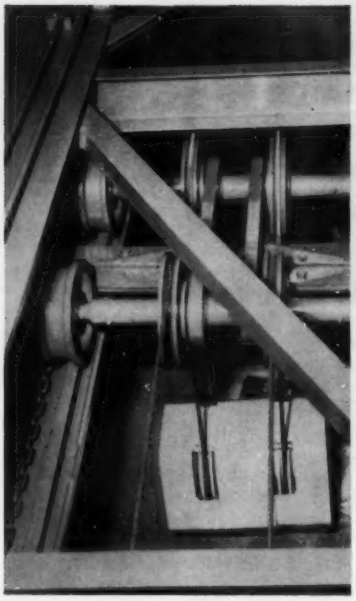
The trolley traverse mechanism, Fig. 6, consists of a 1¼ hp vane-type hydraulic motor, flange mounted to a speed reducer unit which, in turn, drives, by means of a roller chain, a short shaft mounted inside the bridge truck. There are two 8½-in. diameter sprocket wheels keyed to each end of this shaft. Duplicate shaft and sprocket wheels are at the other end of the bridge, in the bridge truck. The drive chains, running the entire length of both bridge girders and behind the trolley rails have their ends connected to opposite locations on the trolley. The trolley, Fig. 4, is thus drawn back and forth across the bridge on rails welded to the bottom flange of each girder. The chain is concealed, for the bottom chains are between the rail and girder web, and the top chains are in troughs above the trolley. This construction prevents any unsightly sag of these chains.

Bridge Drive

The bridge is powered by two 1¼ hp, vane-type hydraulic motors, each flange mounted to a speed reducer unit. Each assembly is mounted on the end of each truck at the opposite ends of the bridge. A roller chain drive, Fig. 2, between the speed reducer and truck wheel axle is employed to impart movement to the crane bridge. This type of drive was selected from many types available because of its simplicity, reliability and low cost.

The hoist mechanism, Fig. 5, consists of a hydraulic cylinder, piston and rod with a four-foot stroke to provide the lift required for this particular crane. The movable cross head, which runs on ball bearing wheels on top of the bridge girders, has six cable sheaves. The stationary cross head has the same, and as the movable cross head is extended by the hydraulic cylinder, an inverse ratio of six to one is achieved.

The bottom block is supported by four parts of cable. Since the six movable sheaves give an inverse ratio of six to one, and since the bottom block must always hang in the bight of the cable, a positive ratio of two



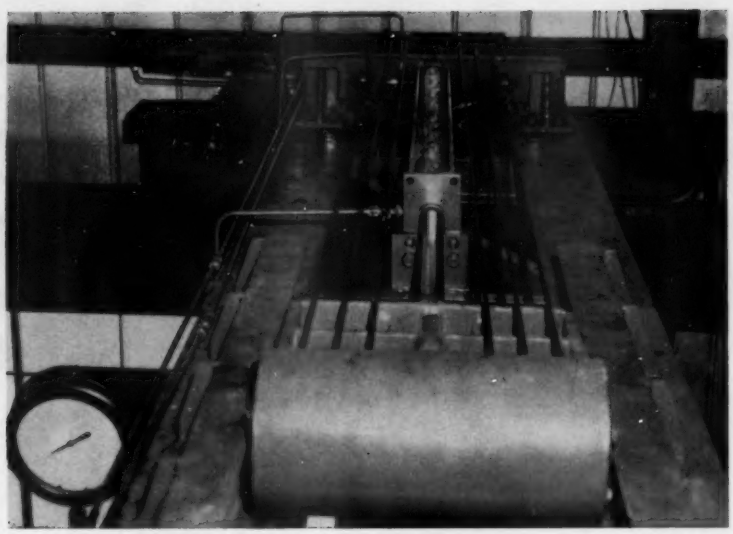


Fig. 4, left. Trolley rides rails mounted on girder flange; chains run along inside flanges of each bridge girder. Fig. 5, above. Hoist mechanism above bridge includes hydraulic piston with four-feet stroke, twelve cable sheaves

to one results. Thus, the net over-all ratio of the lifting block to the piston is three to one, so that for every foot of piston stroke, the block moves three feet.

The requirement for the three-ton crane shown here was for a lift of only 12 ft, therefore, with the sheave arrangement used, a piston stroke of four feet was all that was necessary. Higher lifts, within practical limits, become available by increasing length of piston stroke.

Hoisting Speed

Layouts have been prepared for all-hydraulic cranes with a 10-ft cylinder and with similar cable reeving to give a 30-ft lift. In this design, if a hoisting speed of 30 fpm is required, the piston speed with this reeving will be 10 fpm. For any selected speed with this reeving, the piston speed will be ⅓ of the hook and block speed and the piston rod loading will be three times the load on the hook of the overhead crane.

In the crane's hydraulic circuit, flow from the pump is divided into the bridge and hoist operating valves with flow control valves to limit the volume to each. The trolley operating valve is piped up in series with the bridge operating valve so that flow is through the bridge valve into the trolley valve. The manually operated four-way valves are the full throttling type with no detents so that full advantage can be taken of the inherent infinite variable speed control.

Check and relief valves are used in both the bridge and trolley motions to provide braking action. A counterbalance valve is used in the hoist cylinder line to limit the speed of lowering. A flow divider is used in the bridge circuit to equalize the speed of the two bridge drive motors.

The electric motor driving the hydraulic pump was selected to run on a short term basis. Even though it may be running continuously for several hours, the actual time it is loaded to capacity is small by comparison.

The over-all efficiency of this new all-hydraulic overhead crane compares favorably with that of a modern three-motor electric traveling crane. Though the full load speeds of this 3-ton capacity crane are 175 fpm for the bridge, 100 fpm for the trolley, and 18 fpm for the hoist, any desired speed to suit individual requirements may be easily obtained.

Bridge Structure

An important factor in the elimination of dead weight in this new crane is the bridge structure. The bridge girders, instead of being the usual two reinforced I-Beams or box sections necessary to insure lateral stability, are replaced by either two I-Beams or single web girders connected together across the top with diagonal bracing, resulting in substantially a single girder having unusual lateral stability.

A hydraulic circuit with two pumps, both driven by the same motor, has already been designed. This design consists of a high pressure pump with low volume in combination with a low pressure high volume pump. This circuit is arranged so that pumps will cut in and out automatically, depending upon the load on the hook. Pumps can also be controlled manually. With either method, much time can be saved in crane operation, because the empty hook can be raised and lowered at high speed, and full load raised or lowered from zero to maximum full load speed —all with infinite variable speed control of the hoisting operations.

Fig. 6. Hydraulic motor on left powers trolley; one on right, is for bridge

Should you proof-test a ladder
Does a knot affect strength
How do you set up a ladder
Should you paint a wood ladder
For what loads are ladders designed

An expert answers these questions and others on . . .

Ladders and Ladder Safety

By L. J. MARKWARDT, Asst. Director, Forest Products Laboratory, U. S. Dept. of Agriculture

PRICE OF SAFETY in ladder use is constant vigilance. With that and the exercise of good judgment, correct choice of equipment and proper maintenance, ladder accidents can be greatly reduced. There are four basic keys to ladder safety. These include:

The selection of the right type of ladder for the job. You must determine whether you need a single or an extension ladder, a step ladder, or one of the special-purpose types. Single ladders, extension ladders, and step ladders are the work horses of the ladder family, and serve satisfactorily for general purposes in industry and in business. Other types in common use include platform step ladders, sectional ladders, trestle ladders, and extension trestle ladders.

The procurement of a ladder of proper construction. For normal use a ladder meeting the requirements of the American Standards Association safety code for the construction, care, and use of ladders is recommended. The production of an approved ladder is the responsibility of the manufacturer, and its inspection and maintenance after purchase is the responsibility of the buyer.

Periodic inspection, adequate maintenance, and proper storage. These are essential factors in insuring serviceability and in promoting ladder safety.

The development of safety habits in ladder use. This implies a knowledge of the hazards involved in the use of ladders and a basic knowledge of safety requirements. Good judgment is a most important factor in the development of safety habits.

There are many types of common and special-purpose ladders. Because of the importance of ladder type with respect to ladder safety, a few of the more common types must be mentioned.

Step ladders are designed to be self-supporting. They have flat steps or treads for your foot comfort. A shelf near the top can support a pail or light-weight tools. Standard utility step ladders are not designed for use by more than one person or by a person carrying heavy items.

Platform step ladders are a rugged, sturdy, safety type of ladder with a working platform big enough and strong enough to support not only a man but also some equipment.

Heavy duty step ladders are designed for general industrial use. The front section may be provided with flat steps and the back section with rungs; so designed, the ladder can be used by two people working from opposite sides.

Single ladders are the common type of rung ladder used for both interior and exterior work.

Standard extension ladders are conventional rung-type ladders, usually two or three single ladders fitted with suitable hardware that permits joining them and adjusting them to the length required.

Sectional ladders consist of two or more single ladders so constructed that they can be combined to function as a single fixed-length ladder.

Trestle ladders are an industrial type consisting of two sections hinged at the top to form equal angles with the base. They are designed to permit two men to stand on opposite sides when using power drills or for other operations. The trestle ladder may also be used to support a horizontal stage, work platform, or scaffold. When provided with a means of supporting a vertically adjustable single ladder, it becomes an extension trestle ladder.

These are all commonly used portable ladders. Some serve multiple purposes. Wherever possible, select the type most nearly suited for the job as the first basic step in attaining ladder safety. Above all, remember the common standard ladders are designed to carry one person only. For more than one person, or for unusual loads, special heavy-duty ladders are required.

To help advance ladder safety and establish minimum standards for the production of safe ladders, the American Standards Association has organized a sectional committee with the title, "American Standard Safety Code for Construction, Care and Use of Ladders, Committee A14."

There is available from the ASA an "American Standard Safety Code for Portable Wood Ladders," covering requirements for materials and details of construction for step ladders, single ladders, extension ladders, and other types of portable wood ladders.

There are in draft form two additional codes covering fixed ladders and portable metal ladders. The development of these latter codes has been in progress for several years, and it is expected that they will soon be approved for publication.

It is the manufacturer's responsibility to see that the proper species of wood are used in the proper sizes; that the wood used is properly seasoned; that the natural characteristics affecting strength are limited in accordance with the code requirements; and that the ladder is well manufactured.

Reliable manufacture and inspection will insure a ladder of good quality and strength that is entirely safe when properly used. Wood lends itself read-

ily to visual inspection, so that the limiting of such natural characteristics as is necessary can be readily accomplished.

Inspection of ladder material involves recognition and identification of a number of natural characteristics and defects. Some are prohibited entirely, while others are limited in accordance with their effect on strength. A complete list of items and features to be considered in the inspection of ladder material includes: 1. characteristics excluded in ladders and ladder material — decay; wane; honeycombing; insect damage; shakes; compression failures; 2. characteristics limited by visual inspection — density; checks; pitch pockets; knots; cross grain (slope of grain); compression wood.

Inspection of ladders and ladder material is made by visual examination, facilitated in some instances by special tools or techniques. Some characteristics, such as knots and checks, can be readily seen and evaluated in accordance with the limits on size and location specified for ladder stock. Defects such as compression wood, compression failures, and cross grain require more careful inspection, but their presence is indicated by certain visible characteristics of the wood when it is examined under suitable conditions.

The complete tabulation of characteristics may look formidable, but in

actual practice close and critical inspection is required on only a few features. Routine manufacturing control meets requirements for dimensions, seasoning, and quality of workmanship; excludes material containing wane, shakes, insect damage, and decay; and provides inspection with respect to limitation in size of permissible characteristics. Lumber grades under which ladder stock is purchased from the lumber producer limit or exclude many of these features.

Usually ladder side rails are free from knots, although in reality a small knot at the middle of the width of a side rail has little effect on strength. A knot at the center of a rail may affect strength no more than the hole bored for the rung, assuming knot and hole to be of the same diameter.

This leaves mainly decay, compression failures, compression wood, and cross grain as the principal characteristics requiring special inspection.

Decay is produced in wood by plant organisms known as fungi, which live on wood substance. Advanced stages of decay can readily be recognized, (See Fig. 1, center), but any ladder material containing either incipient or advanced decay should be rejected. Wood kept in a dry condition will not decay.

Compression failures are injuries to the fibers resulting from excessive compressive stress along the grain, so that the fiber walls are buckled. Pronounced compression failures are well defined and can be readily seen on the surface of a piece without magnification. Less pronounced compression failures can usually be detected by the technique of incident lighting, using a reflector spot bulb that is focused at an angle of about 20 deg to the surface.

The presence of compression failures of both the pronounced and the less pronounced types can usually also be detected by a characteristic fiber breakage that shows on sawn end-grain surfaces of lumber. Both decay and compression failures are prohibited defects.

Compression wood is an abnormal type of growth occurring in softwood species, principally on the under side of leaning trees. It is generally denser

than normal wood and usually distinguishable by very wide annual rings, lack of contrast between springwood and summerwood, and with summerwood yellowish in color. Compression wood varies in degree from pronounced types to types differing but little from normal wood. (See Fig. 1, right.)

Compression wood in limited amounts does not seriously affect strength and may accordingly be admitted with limitations in ladder stock. The following limitation on compression wood is recommended: "No single streak of compression wood in a

Do's and Don'ts of Proper Ladder Use

- Select the proper type of ladder for the job.
- Inspect your new ladder after purchase.
- Do not test that ladder.
- Place the ladder properly to reach the desired height.
- Place portable single and extension ladders at a pitch such that the horizontal distance from the top support to the foot of the ladder is one-fourth of the length of the ladder in use.
- Do not use single or extension ladders in a horizontal or nearly horizontal position as a platform, runway, or scaffold.
- Make sure the feet of the ladder are firmly and evenly supported. Use safety feet when necessary.
- Do not place ladders on boxes or other insecure objects to gain additional height.
- In setting up a step ladder, be sure the legs are fully spread and that the spreader is locked (braces set).
- When working in front of a doorway, make sure that the door is guarded or locked.
- For other than short ladders, secure additional help for safe handling.
- Always face the ladder when ascending or descending.
- Whenever possible, use both hands in climbing.
- Do not hurry when going up or down a ladder.
- Do not stand on the top or next-to-the-top step of a ladder — this is an unstable position.
- Be careful not to lean too far over on one side; do not overreach; for safety, move the ladder to the work.
- Do not overload the ladder.
- With the exception of special types, ladders should be limited to use by one person.
- Do not leave tools on the platform — they may be dislodged and create a hazard.
- Do not abuse a ladder in handling by letting it fall.
- Inspect ladders periodically after service use.
- Store wood ladders in a dry location, away from excessive heat.
- Support ladders in storage so they do not sag.
- Examine fittings occasionally to make sure they are tight and functioning properly.
- Examine the rope on extension ladders, replace as necessary.

ladder part shall exceed ½ in. in width, nor shall the aggregate of streaks in the part exceed ¼ the width of a face. Bow or crook shall not be greater than 1/16 in. for each two feet of length."

Cross grain comprises a deviation in the direction of wood fibers from a line parallel to the sides of the piece. Severe cross grain, as indicated by steep slope of grain, seriously reduces the strength of wood. Requirements for ladder parts impose a limitation of 1 in 12 for rails and steps and 1 in 15 for rungs.

Frequently cross grain can be readily detected from the appearance of the piece. However, in many instances the determination of the degree of cross grain as a basis for acceptance of ladder stock can be facilitated by means of a simple instrument called a scribe. The inspector pulls the scribe in the grain direction along the surface of the piece. The point follows the grain, permitting a ready evaluation of the slope. (See Fig. 1, left.)

Metal Ladders

Special mention of characteristics and inspection of wood ladders has been made because of their general serviceability and adaptability. Portable metal ladders of aluminum and magnesium and their alloys are now also available in a number of sizes and types. They are adaptable to a large variety of uses, but are not recommended where possible contact with electrical wiring may be a hazard. The new ASA code covering portable metal ladders will be an important factor in developing their use and in promoting safety.

It may be noted that this inspection procedure makes no provision for test loading of wood ladders. There is no simple satisfactory method of proof testing wood for strength, and any test loading much beyond the design load may result in serious damage to the side rails.

Sometimes a ladder is tested while supported horizontally on horses at the ends by having a man jump on it at the center. Such a test method should never be used, because it subjects a ladder to more severe loads than it was ever intended or designed to carry and because, even if it does not fail, it may sustain damage in the form of compression failures that can lead to sudden failures and a serious accident in future use. So, don't test that ladder! Rather, give it a critical visual inspection to insure that it meets all requirements.

Bibliography

If you would like a bibliography on inspection and testing of wood and wood ladders, and safe practices in the use of ladders, write to the Editor, Plant Engineering, 110 S. Dearborn St., Chicago 3, Ill., or write "Ladder Bibliography" on one of the postage paid cards in this issue.

Since both wood and metal ladders may be damaged in service, develop loose joints with loss of rigidity, or suffer impairment, it is important in the interest of safety to provide periodic inspection, adequate maintenance, and proper storage.

Wood does not deteriorate with age when protected from adverse exposure and from decay. Ladders that are properly used, cared for, and maintained will have long life and give continued service over many years.

Ladders should be inspected frequently to determine whether repair is needed, or whether they have become unserviceable. Assuming adequate initial inspection, there need be no further concern over the natural characteristics of the wood, such as cross grain and knots, which cannot change.

Good maintenance practice requires that the hardware and fittings be securely attached and that movable parts operate freely. A wobbly ladder is dangerous to use and should be discarded if the loose parts and connections cannot be tightened enough to restore its original or required rigidity. Rope on extension ladders should be replaced when necessary, and metal bearings of locks, wheels, and pulleys should be lubricated. Ladders that are known to have fallen or to have been dropped should be carefully inspected for damage before being returned to service.

Joints between steps and side rails of wood ladders should be kept tight. If a side rail is broken, either the ladder should be discarded, or a complete new side rail of proper size and quality should be installed. Broken side rails should not be spliced.

Wood ladders, except for certain specialty types, are sold in an unpainted or unfinished condition. In this condition, the ladder parts can readily be checked for cross grain, compression failures, and quality of wood. A transparent finish such as varnish, shellac, or a clear preservative is recommended. Another recommended procedure is treatment with a water-repellent preservative, that provides both water repellency and some protection against decay. With such finishes or treatments, the ladder can be inspected from time to time as readily as if left unfinished. Some State safety codes require transparent finishes or that ladders be left unpainted for these reasons.

On the other hand, when adequate initial inspection has been made, some

(Continued on page 218)

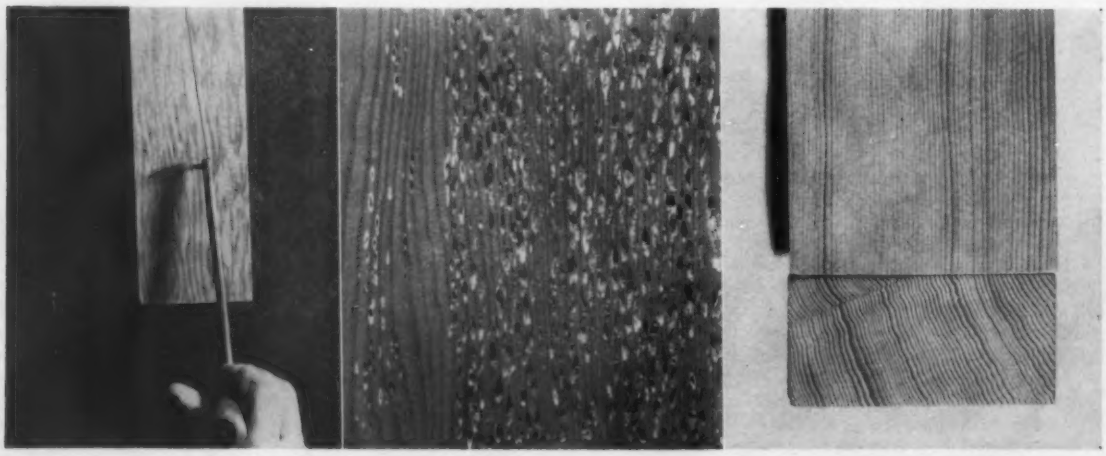
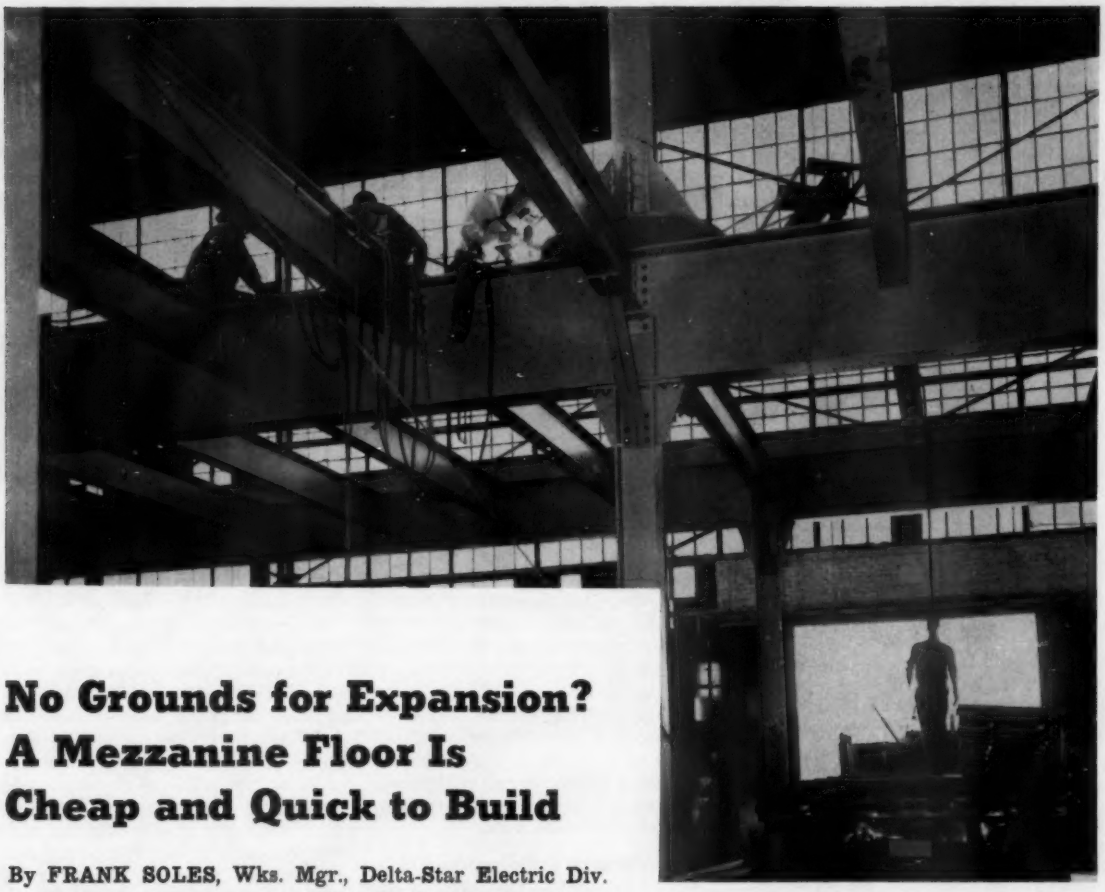


Fig. 1. Scribe (left) determines slope of grain. Decay (center) compression wood (right) are detected by visual inspection



No Grounds for Expansion? A Mezzanine Floor Is Cheap and Quick to Build

By **FRANK SOLES**, Wks. Mgr., Delta-Star Electric Div.
H. K. Porter Co., Inc. of Pittsburgh, Chicago, Ill.

Fig. 1. Steel erection for mezzanine in progress

GROWING PRODUCTION of switchgear and expanded metal cable ways was causing so much crowding of departments that we had to face the fact that more floor space in the plant was essential. The question was, "Where?" Outside space was already utilized quite thoroughly as storage and loading areas. Expansion beyond the present limits of company property was also out of the question, since we are bounded on the north side by two main line railroads; to the west by a coal yard; and to the south and east, by city streets.

The only remaining direction was up, and after an inspection of the plant, the bay that housed the structural steel department was chosen for remodeling by the addition of a mezzanine floor. This bay was high, already had an overhead crane with a clearance of 40 ft which would allow ample room for the extra floor, and was close to the hot-dip galvanizing department. All these factors made it suitable for remodeling to house the major portion of the shearing and punching operations of the structural steel department on a second floor.

With this move, the overcrowded assembly operations could be accommodated in the ground floor space formerly occupied by the structural steel department.

The remodeling project provided us with almost 13,000 sq ft of additional floor space at a cost of $4.60 per sq ft. This comparatively low cost was attributed to the fact that we had neither roof nor walls to construct and was an influencing factor in our choosing this method of gaining space. Cost for installing services such as wiring, water, heating and lighting amounted to approximately $13,000.

Effective Preparation

So that a minimum of production time would be lost, a schedule was worked out for the complete operation of building and relocation. The main work was planned to be undertaken during the annual two-week plant vacation period in August. That the planning was accomplished effectively was demonstrated by the fact that on the first day the plant was reopened after the vacation, production reached 80 per cent of normal, and on the following day, returned to 100 per cent.

Preliminary work on the project started in April with the pouring of the concrete footings for the twenty two columns which were eventually to support the new floor. Each Monday for six consecutive weeks, machinery was moved as necessary and footings poured with no interruption of production.

On the Friday and Saturday prior to the beginning of the vacation period a skeleton crew cleared the bay where construction was to start on the following Sunday. Steel was moved outside for storage, jib cranes and a monorail hoist were dismantled and all machinery, including six punch presses, planned for the mezzanine floor were placed in the well of the mezzanine ready for moving. Two 15 ton trolleys on the overhead crane in the bay were used to move this machinery and the steel used in construction of the floor.

Sunday morning, on schedule, steel erection began and was completed in two and a half days, one half day ahead of planned time. Ten main cross beams of 33-in., 141 lb steel were

laid on 20 ft centers, while 130 16-in., wide flange, 40 lb steel beams, were laid lengthwise on five ft centers. The entire floor was supported by the twenty two 10-in. wide flange 33 lb steel columns rather than hung from existing steel work in the building.

Steel finishing including welding, special bracing at machine locations, and welding jib booms to the steel structure occupied one and a half days.

Laying the Deck

The next big job was laying the deck. For this, Corruforms were used —forms made of galvanized steel corrugated sheets into which concrete is poured and which remain permanently in place. The under side of the forms needed no finishing other than painting to make the ceiling of the first floor.

Once the Corruforms were in place, reinforcing steel, conduit and pipe for wiring, air and water outlets were laid and the concrete poured.

Since fast curing concrete was used for the job, we asked the contractor for an estimate of how soon we would be able to place machinery on the floor without danger of the concrete cracking. He suggested that three days should be sufficient to cure the concrete to provide a minimum strength of 2000 psi. On the morning of the third day we ran tests on cylinders that had been poured at the same time as the floor. All three cylinders tested at more than 50 per cent above the minimum requirement.

Two stairways and a 30-in. high pipe guard rail around the floor were next installed, while the Corruform and reinforcing steel were being placed. Original plans called for a pipe rail guard only but it was deemed necessary to provide some safety measure against the possibility of material falling through the rails. Expanded metal sheets were therefore welded to the pipe railing around the entire mezzanine.

The installation of concrete pads, reinforced with steel, at individual machine stations, completed the construction work.

The way was now clear at the beginning of the second week to move the machinery into place and to install the various services such as wiring, water and air outlets and lighting. Moving and installing the machinery of the two departments concerned, was done by a crew of 15 men, all of whom worked a 10-hr day for six days during the second week.

Lighting, originally used on the first floor was raised and modified for the mezzanine. There, 300 w incandescent fixtures provide the overall illumination while fluorescent lights provide

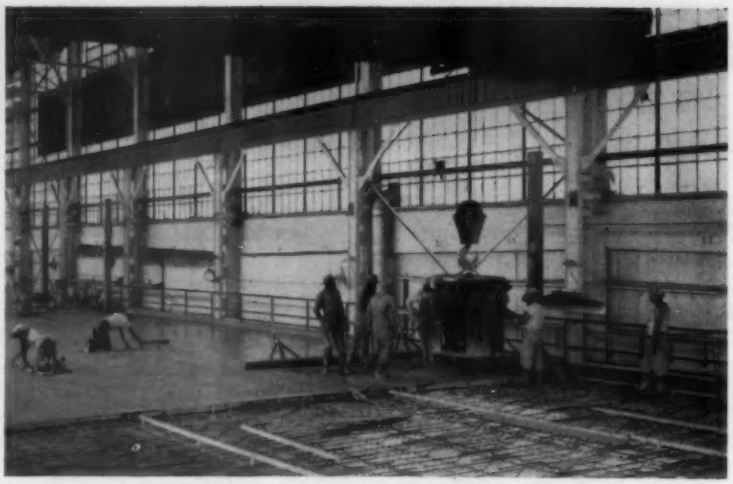


Fig. 2. At this stage, Corruforms are laid, reinforcing steel, conduit and piping for wiring, air and water are in place, and some concrete has been poured

accessory lighting at individual machines. New, two-tube, 200 w fluorescent fixtures were installed for the first floor to provide a level of illumination of 30 ft-c.

Wiring for machines, jib cranes and 110 v utility wiring was installed under the deck and through the preplaced conduit in the deck. At the same time, three water coolers and ten compressed air outlets were connected, also through preplaced pipe in the floor.

Machine Installation

The newly galvanized surface of the Corruform was painted with a vinyl base primer, then finished with a white flat oil base paint. The vinyl base was chosen as a prime coat in preference to a zinc chromate paint, also suitable for finishing newly galvanized steel, since its fast drying qualities allowed a finishing coat of paint to be applied the same day.

Originally the overhead crane had been used for servicing machinery in the one-story steel department area. It was felt that moving 75 to 100 tons of steel per week between the first floor and mezzanine would now fully utilize the overhead crane time. In order to take some of the work load from the overhead crane, four one-ton jib cranes were installed for use with the punch presses in the structural steel department. These jib cranes, along with a new semi-automatic punch press scheduled for delivery at this time, were installed as part of the overall operation.

The conclusion of this expansion program proved to be a good demonstration of the advantages to be gained by fully utilizing plant air rights.

Fig. 3. Mezzanine floor has been completed and structural steel department is in operation. Expanded metal sheets were later welded to the guard rail

How the Army Controls Maintenance

Tools Employed Simplify Task of Maintaining Facilities

By R. L. MARINELLO, Managing Editor, Plant Engineering; with an introduction by
KEITH R. BARNEY, Brig. Gen., USA, Director of Installations,
Office, Deputy Chief of Staff for Logistics, Department of the Army

THROUGHOUT THE WORLD, the U. S. Army maintains a most diversified type of plant, and operates it over a complete variation of climate. This plant ranges in climate from barracks in the tropics where heat is used only to "dry closets" to prevent mildew; to frame structures in Alaska, where it is necessary to install radiator valves in such fashion that they cannot be entirely closed, in order to avoid freezing; in housing type from the lightest wood frame structures of World War II to solid masonry bearing walls of about the time of the War of 1812; and in character of occupancy from the lofty Chapel at the Military Academy to a drop forge.

Naturally, the Army has always been interested in trying to operate this immense plant economically and maintain it efficiently. Our efforts in this area became particularly intense after World War II. The present system was devised at that time, and has been constantly studied and improved since.

The following article describes the system, and some of the principal features. The whole operation is now acquiring some background of experience, and it is not felt that it is any longer new and untried. Substantially fully developed before the Korean emergency, it weathered the expansion of that conflict without undue difficulty. It is considered fairly responsive to the needs of command, to the availability of resources, and to the needs of internal control that such a diversified operation must have. However, the Army itself is the first to admit it is not perfect.

The program in the Army is implemented from the Office of the Assistant Secretary of Defense (Properties and Installations), Mr. Franklin G. Floete, through the Assistant Secretary of the Army (Financial Management), Mr. Chester R. Davis, under the direction of the Deputy Chief of Staff for Logistics, Lt. General Carter B. Magruder, with staff supervision from the Chief of Engineers, Lt. General S. D. Sturgis.

KEITH R. BARNEY, Brigadier General, USA
Director of Installations
Office, Deputy Chief of Staff for Logistics
Department of the Army

AMONG ITS MANY other jobs, the United States Army has the task of maintaining over one billion square feet of building space along with related facilities such as grounds, roads, railroads and utility plants and systems. In addition, utilities services, fire prevention and protection and custodial services must be provided for a population in excess of two million persons. In Fiscal Year 1955 over one-half billion dollars were spent on these activities.

These facilities and populations are located at 330 major installations in the United States and in overseas areas.

Objectives of Program

The general objectives of the Army maintenance program are:

a. To furnish utilities services, fire protection, maintenance, management and other services at Army installations in accordance with operating policies which emphasize conservation of resources and economy of operation.

b. To provide maintenance and repair to real property and appurtenant facilities sufficient to protect the facilities from deterioration beyond normal wear and tear and to assure their economical and efficient utilization for the expected period of use.

c. To accomplish alterations, additions and other modifications to existing facilities, and minor construction, as necessary to provide adequate facilities for using activities.

d. To provide maintenance and services, and appropriate lay-up measures, for inactive facilities sufficient only to permit reactivation as required.

What is the best means of accomplishing these objectives? Based on past experience, the Army has found that the following techniques and tools have been most helpful in maintaining its facilities.

Organization—It is essential that there be an effective organizational set-up at each management level. In the Army, the maintenance program is so arranged that responsibilities for

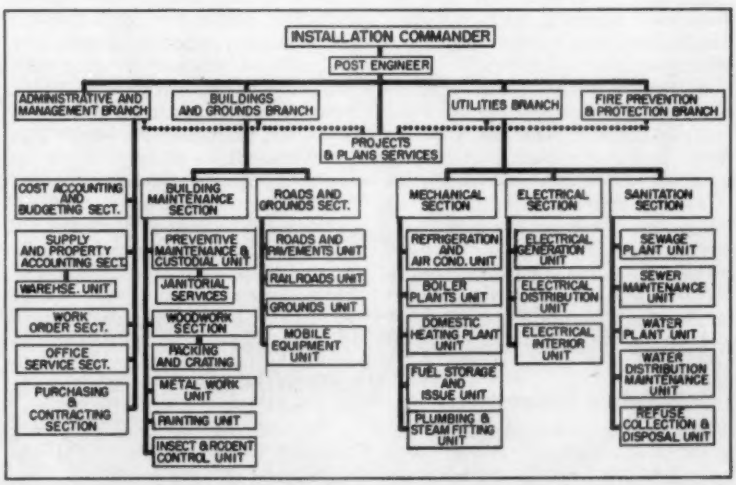


Fig. 1. Typical organization chart of a post engineer. He has the same responsibilities on an Army installation that a plant engineer has in industry

Table I. Shows the basic unit quantities and unit costs in the continental United States by installation category for the

Activity	Unit of Measure	Total Army Areas Quantity	Total Army Areas Unit Cost	Major Troop Facilities Quantity	Major Troop Facilities Unit Cost	Misc. Posts & Camps Quantity	Misc. Posts & Camps Unit Cost
Management & Engr	% total cost		6.41		5.46		7.42
Utilities Operation							
Water systems	1000 gal	42,976,052	$ 0.085	25,362,673	$ 0.061	9,648,261	$ 0.115
Sewage systems	1000 gal	27,771,590	0.056	17,678,834	0.038	5,165,280	0.074
Electric systems	kilowatt hour	1,351,942,630	0.011	667,579,815	0.009	325,127,770	0.013
Boiler plants	1000 lb	16,604,196	0.949	6,952,689	0.943	2,759,619	1.075
Heating systems	1000 cu ft	3,411,308	6.830	1,872,048	6.899	665,375	9.908
Refrigeration	horsepower capacity	104,748	16.594	42,129	16.795	24,870	19.958
Fire Protection	company	244	62,268.952	77	61,088.613	52	54,176.377
Other Repair & Utility Services							
Refuse handl & can wash	cu ft	6,390,595	1.219	2,775,198	1.419	1,087,122	1.362
Insect & rodent control	1000 sq ft	639,115	3.260	227,533	3.458	95,543	4.648
Packing & crating	1000 lb	195,997	54.892	91,489	50.286	81,782	58.431
Custodial services	sq ft	34,992,629	0.207	15,042,416	0.180	17,910,660	0.231
Maintenance & Repair Utilities system							
Water systems	lin ft	30,572,798	0.103	13,774,483	0.076	5,895,537	0.136
Sewage systems	lin ft	28,069,787	0.074	13,483,214	0.059	4,744,095	0.122
Electric systems	lin ft	41,431,340	0.074	16,719,057	0.067	10,244,401	0.073
Boiler plants	boiler horsepower capacity	448,378	7.202	175,328	5.635	72,762	7.725
Heating systems 100 hp and over	1000 cu ft	406,612	1.399	134,923	0.780	93,471	3.173
Gas distr, mains & services	lin ft	6,102,139	0.067	3,087,903	0.079	1,200,037	0.037
Refrig & installing air compressors	horsepower capacity	70,573	24,320	28,220	31.310	11,207	37.670
Liquid petrol prod disp systems	1000 gal cap	163,297	0.985	13,330	5.541	136,711	0.292
Buildings & other structures							
Permanent bldgs	sq ft	298,975,353	0.078	58,866,336	0.091	57,729,808	0.155
Temporary bldgs	sq ft	318,089,801	0.135	162,207,489	0.135	33,619,007	0.201
Grounds & roads							
Grounds	acre	8,358,447	1.276	2,464,020	1.578	4,866,478	0.593
Railroads	lin ft	13,268,604	0.321	1,708,603	0.295	517,613	0.609
Surfaced areas	sq yds	320,556,958	0.041	124,274,244	0.041	56,217,467	0.042
Other activities							
New const & modif work	% total cost	—	11.91	—	11.6	—	12.9

specific functions can be placed in a similar pattern at all levels, from the departmental down to the most remote installation where the work is actually performed.

An important man in this organizational set-up is the post engineer. He has the same responsibilities on an Army post that a plant engineer has in industry. Since he is the custodian of all real property on the post, it is his job to determine which items of work require immediate attention and which can be placed on backlog when resources are limited. A standard organizational chart of a post engineer and the variety of facilities under his responsibility is shown in Fig. 1.

Standard Nomenclature

Standard Inventory—A constant up-to-the-minute inventory of real property, at headquarters as well as at the field installation, is another important tool of an efficient maintenance program. To be sure that the information is the same for all posts and installations, property records and reports are based on standard nomenclature and units of measure, covering such things as building categories and road types. With this standard system set down, the magnitude of the job can be ascertained at all levels from the remote installation to the Department's headquarters in Washington, D. C.

Technical Manuals—As another aid in getting the work done properly, the Army publishes Technical Manuals which serve as guides to maintenance personnel. They are written in a language that can be understood and applied by the workmen at the installation level where the work is actually performed.

With craftsmen performing the work scattered throughout the world, the best method of disseminating the latest technological developments is through technical manuals.

A typical example of these technical manuals is one on preventive maintenance of buildings and structures (TM 5-610)*. The objective of this manual is to provide principles and guidance in establishing a regular program designed to prevent major repairs by finding and fixing minor deficiences at the start.

Inspections and Reports

Inspection—A successful maintenance program also calls for an organized system of inspection to show how well the job has been done. This is accomplished by having the technicians, responsible for the overall administration of the various elements of the maintenance program, go into the field to inspect the work.

Staff teams from the Office of the Chief of Engineers visit each command (e.g., an Army Headquarters or

*See boxed item "List of Technical Manuals Available," on opposite page.

fiscal year 1956. (Because of limited space, it is not possible to include the total costs for the various categories)

Depots and Arsenals		Class II Hospitals		Port Facilities		Inactive Facilities	
Quantity	Unit Cost	Quantity	Unit Cost	Quantity	Unit Cost	Quantity	Unit Cost
	6.88		5.75		7.88		11.5
5,232,327	$ 0.131	865,286	$ 0.110	591,821	$ 0.187	1,275,684	$ 0.101
2,957,831	0.127	589,115	0.080	375,412	0.048	1,005,118	0.072
256,843,583	0.013	48,455,572	0.010	31,008,467	0.014	22,927,423	0.016
4,670,314	0.943	1,643,218	0.802	399,031	0.879	179,325	0.925
668,972	4.190	40,455	4.035	54,179	4.157	110,279	3.901
24,420	13.369	4,700	16.681	1,646	14.321	6,983	3.256
83	68,259.787	7	62,429.857	6	59,455.833	19	39,455.833
2,014,442	0.833	200,226	1.239	228,063	1.362	85,544	1.517
207,405	2.434	12,714	4.931	24,663	2.450	71,257	0.677
16,058	61.611	1,633	69.128	1,459	55.446	3,576	35.287
332,279	0.195	—	0.063	61,744	0.218	1,645,530	0.060
5,808,960	0.121	333,770	0.294	443,468	0.167	4,316,580	0.025
5,523,700	0.063	396,656	0.095	473,985	0.147	3,448,137	0.011
7,861,584	0.074	594,888	0.090	747,977	0.215	5,263,433	0.019
117,463	8.109	34,404	10.223	10,583	7.792	37,838	1.638
169,398	1.071	573	2.058	5,784	0.382	2,463	0.270
452,755	0.080	91,923	0.008	85,453	0.034	1,184,068	0.014
21,763	8.150	1,983	40.366	1,172	21.684	6,228	11.124
6,165	4.749	251	1.020	824	16.564	6,016	1.838
157,005,072	0.053	10,103,703	0.179	9,568,430	0.117	5,702,004	0.038
49,125,946	0.100	2,609,058	0.120	5,849,453	0.106	64,678,848	0.021
365,163	6.520	2,851	134.961	6,660	27.356	653,275	0.618
9,628,632	0.283	25,925	1.511	612,392	0.739	775,439	0.036
93,600,040	0.038	1,419,745	0.078	3,077,180	0.080	41,968,282	0.007
—	10.8	—	14.8	—	13.0	—	6.5

Overseas Command) at least once each year. These visits are extended to representative installations within each command in numbers adequate for the evaluation of the major command's administration of this program.

Reports are written by the staff team assessing the program at the command visited. Conclusions and recommendations are made. These reports are then transmitted by the Department of the Army to the major command for concurrence or comments. Having evaluated the comments, the Department of the Army then takes action to direct compliance with the recommendations as appropriate.

Each major command is also required to make an inspection of each station within that command at least once a year. The same procedure is followed with respect to reporting except that the major command directs the action to be taken.

Accounting System — Costs always play an important role in any program. In addition to supplying information on what the program costs, an adequate accounting system is another effective tool for proper administration of a maintenance program. The Army utilizes a cost accounting system which relates the costs of each function to appropriate workload measurements.

From these costs, the actual accomplishment is determined as compared to approved programs. Comparisons are possible between commands and installations. Based on the results of these comparisons and past experi-

List of Technical Manuals Available

Following is a list of just a few of the many Technical Manuals which may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. Readers interested in a list of all the Technical Manuals, should write to the Editor, Plant Engineering, 110 S. Dearborn St., Chicago 3, Illinois, or indicate "Technical Manuals" on the postage-paid card in this issue.

TM 5-615	Concrete and Masonry, Repairs and Utilities	35c
TM 5-617	Roofing, Repairs and Utilities	30c
TM 5-619	Plumbing, Repairs and Utilities	30c
TM 5-632	Insect and Rodent Control, Repairs and Utilities	75c
TM 5-661	Inspection and Preventive Maintenance Services for Water Supply Systems	50c

ence, unit costs are developed as a guide to future expenditures. Wide variances in costs are investigated to determine the cause. Corrective action is instituted where warranted. The cost factors are also compared with quality of performance as determined by inspection of the facilities and operations.

Programming—The Army's programming system for maintenance and services at its facilities comprises a comprehensive set of management techniques. The technical manuals provide the details of how the job should be done from a technical and continuing viewpoint. The programming system as such starts with a statement of objectives and policies applicable to a specific period (fiscal year) under the operating conditions for the Army as a whole for that period. Workload is carefully estimated and scheduled at each administrative level. Requirements of funds and personnel are determined on the basis of these objectives, policies and workload projections. Approved programs are established as guidance for planning and scheduling actual work performance at the field installation.

Basic Tool: Cost Budget

The above outline gives a very general picture of the programming process. At the working level the basic tool is the cost budget. For uniformity and comparability, a standard form is used (DA Form 5-10), on which workload and cost data for three consecutive fiscal years are presented, including the estimate for the year being budgeted. Information is furnished for the 28 basic functions of repairs and utilities. Costs are in terms of work accomplished, as recorded in the Army's cost accounting system for this activity, and are translated into actual fund requirements through analysis of inventory levels, work in process and credits for resources furnished from other sources. The approved cost budgets constitute the basis for fund allowances to each installation.

Cost budget represents a program for the more routine jobs which occur more or less on a day-to-day basis. Major jobs of maintenance or alteration are generally programmed in terms of priority lists of projects which are carefully screened for appropriateness and necessity, reviewed for technical correctness and approved to the extent possible within available resources.

Maintenance Backlog—The yard stick which has proved to be extremely valuable in rounding out the Army's maintenance program is the backlog of essential maintenance. It is defined by the Army as work which engineering and maintenance experience indicates as desirable to be performed currently but which must be deferred because of limited funds.

This backlog includes items of repair work which should be done to prevent costly deterioration, remove hazardous conditions, or replace essential components of facilities which are beyond economical repair. It may also include items of work required to correct operating deficiencies with resulting savings which will amortize the costs within a few years or will increase the efficiency, and, items of repair work required at inactive facilities which are necessary to assure weather-tightness and structural soundness in buildings, or, prevent major deterioration of facilities.

Examples are: reroofing or refloor-ing in buildings, resurfacing of roads, replacement of water lines, installation

Table II. Shows the estimated backlog of maintenance projects for FY 1955

Facilities	Unit of Measure	No. of Units	Total Cost (in thousands)	Unit Cost
Electric:				
Interior facilities	lin ft	3,537,841	$3,455	$0.977
Overhead lines	lin ft	1,351,522	1,888	1.397
Underground lines	lin ft	257,788	908	3.522
Other	—	—	777	—
Heating & Hot Water:				
Pipe insulation	lin ft	340,151	685	2.014
Other	—	—	5,760	—
Plumbing:				
Building pipes	lin ft	1,422,063	1,716	1.207
Water & Sewer Systems:				
Distribution lines	lin ft	385,482	1,640	4.254
Other	—	—	2,236	—
Buildings & Structures:				
Roofing	square	987,098	6,895	6.985
Siding	square	126,198	3,534	28.004
Doors & windows	opening	143,794	4,575	31.816
Screens	opening	184,985	1,430	7.730
Steps & platforms	entrance	19,070	1,685	88.359
Floors	sq ft	8,145,969	3,892	0.478
Floor covering	sq ft	12,315,522	4,602	0.374
Wharves & piers	—	—	6,143	—
Painting int & exterior	square	3,559,872	12,611	3.543
Structural	—	—	6,702	—
Misc structures	—	—	2,856	—
Surfaced Areas:				
Concrete pavement	sq yd	1,317,821	1,422	1.079
Bituminous pavement	sq yd	15,544,646	12,514	0.805
Other	sq yd	8,006,316	2,862	0.357
Miscellaneous:				
Bridges, trestles & culverts	lin ft	111,542	1,672	14.990
Drainage channels	lin ft	1,660,866	800	0.482
Storm sewers	lin ft	273,936	954	3.483
Railroads	lin ft	1,346,178	5,804	4.311
Erosion control	acre	45,229	2,264	50.056
Training facilities	—	—	394	—
Dredging	cu yd	742,900	350	0.471
Other items	—	—	2,062	—
TOTAL			$105,088	

Table III. Integrates current and backlog data for building maintenance areas

Program Item	Maintenance Backlog 30 June 54	Maintenance Costs FY 55	Maintenance Backlog 30 June 55
1. Building shell	$110,000	$112,000	$125,000
2. Floor finishes	31,000	48,000	26,000
3. Painting	385,000	137,000	291,000
4. Roofing	13,000	38,000	14,000
5. Plumbing	64,000	76,000	79,000
6. Heating	12,000	210,000	13,000
7. Electric	—	63,000	31,000

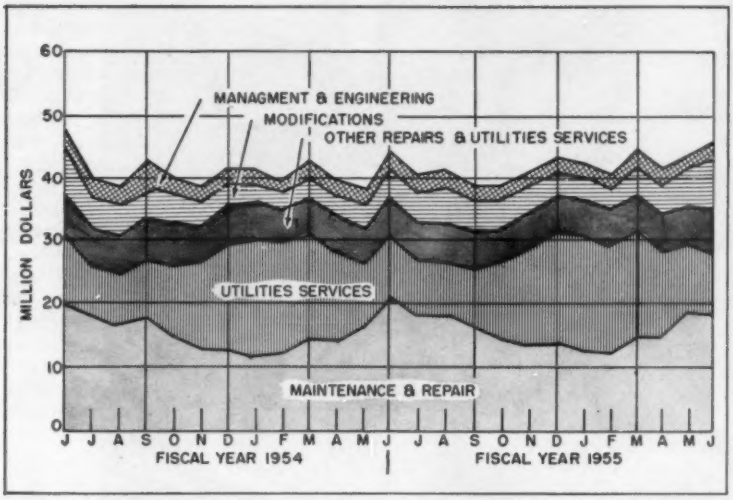


Fig. 2. Chart shows the monthly repair and utility costs for fiscal years 1954 and 1955. These activities and their unit costs are mentioned in Table I

of automatic fuel handling equipment in a large boiler plant, or looping of water lines to improve water flow.

The extent of this backlog is determined from reports (DA Form 5-12) submitted early in the fiscal year (beginning July 1st) by each Army installation. The gathering of this data is a continuing responsibility of the post engineer. Items programmed are based on an "on-the-ground" survey and must be supported by detailed backup information at the installation.

At the beginning of the fiscal year, then, the post engineer knows what his total maintenance job is, generally in terms of specific projects and priorities. When the budget program becomes known, he can estimate how much of his maintenance job can be accomplished in that year. Any unprogrammed balance is reported as a backlog item.

Estimating Maintenance Job

An example of the use of this information is illustrated in Table III which integrates data from the Backlog Maintenance Report and from the current maintenance operations cost reports as might be applied to seven selected areas of building maintenance at a typical Army installation.

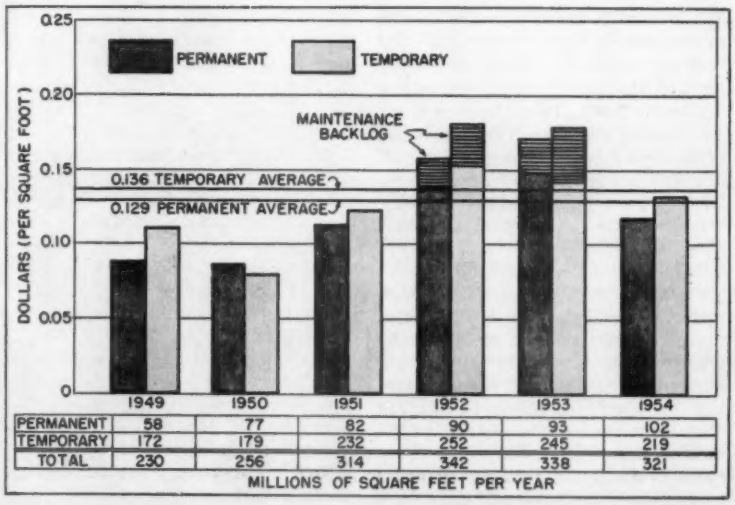
An overall review of the foregoing table reveals that maintenance backlog increased a total of $61,000 for all areas listed except "Floor Finishes" and "Painting," which show reductions during fiscal year 1955. Inspecting further, the increases or decreases for all items except "Painting" appear to be reasonable, although all will be thoroughly analyzed. The high beginning and ending backlog for "Painting" together with a $137,000 expenditure during the year strongly indicates the need to thoroughly analyze this item to determine whether some of the $137,000 spent for painting might have been better spent to reduce other maintenance backlogs.

In a similar manner analyses and evaluations are possible for all the remaining areas of maintenance. A typical example of this is the program which was initiated for the surveillance and control of the fungi causing wood rots and the wood-destroying insects at Army installations in 1948.

The problem of maintaining existing permanent and temporary structures included repetitive replacement of lumber and other forest products in parts of the structures exposed to soil and to excessive moisture conditions. Solution of this problem calls for the following steps: a. Inspection and detection of rot and insect damage in existing buildings every six months; b. Replacement of damages or destroyed wood with preservative-treated wood; and c. Treatment of soil in areas likely to contain termite colonies with soil poisons. These procedures have been included in appropriate Department of the Army directives (AR 420-70, AR 420-76, TM 5-632).

The savings that have accrued at Army installations by the uses of treated wood are substantial. These include the use of less lumber and avoids the high costs of frequent repair and replacement. An example of savings that accrued at one installation through use of treated wood is as follows: 1600 tent frames were constructed with treated wood in 1950. Many of these replaced untreated frames which had been in service only two years. After five years the treated frames are still sound and in serviceable condition. It is estimated that two replacements since 1950 of untreated frames would have cost $1,992,000.

The foregoing is but a brief outline of the system used by the Department of the Army in the management of its maintenance program. However, it will be seen that the program includes the means necessary to determine what needs to be done, who should do it, how it will be done, what it will cost, and what has been left over. The system is adversely affected if any one of the basic elements is lacking. It is difficult to say that any one element is more important than another. Without the effective administration of each, the program will not be successful.



	1949	1950	1951	1952	1953	1954
PERMANENT	58	77	82	90	93	102
TEMPORARY	172	179	232	252	245	219
TOTAL	230	256	314	342	338	321

MILLIONS OF SQUARE FEET PER YEAR

Fig. 3. Chart indicates unit cost per square foot for maintaining permanent and temporary types of buildings on the numerous posts, camps and stations

Fig. 1. Installation of new type storage rack at the warehouse of M. Buten & Sons, Philadelphia. Based on gravity feed, new case slips into position when front case is removed. Picking from broken cases is made considerably easier, a valuable feature in some warehouses dealing in less than case lots

Racks Help Make the Warehouse

Inventory Control, Space Saving Two of Many Possible Virtues

By ARTHUR C. FARLEY, Artco Corporation, Flourtown, Pa.

WAREHOUSES CAN'T MAKE money. Storage of merchandise always is and always will be a necessary evil because it is a necessary cost. However, there is no need to waste hundreds of millions of dollars annually because too little attention is paid to the problem.

Many business managers have reached the top through production, finance, or sales. By whichever route, the chances are today's president has little or no detailed knowledge of storage and materials handling methods. The resulting neglect has made the warehouse the poor stepchild of merchandising.

It is not destined to remain so. Experts in warehouse design and layout, materials handling, and properly engineered storage systems are gradually changing the picture by introducing modern, cost-saving methods that often pay for themselves within a year. Yet even the experts sometimes neglect the storage rack. There are many, many types of racks designed for virtually every type of inventory and their quality and price vary surprisingly.

A storage rack is more than just a place to put things. Properly designed, it increases storage space, reduces handling costs, greatly decreases damage to merchandise and equipment, permits shipments to move on time, and eases inventory control. In short, it makes for orderly housekeeping. But these results can be achieved only if the storage system is engineered for the job. A storage system that successfully meets one set of problems will rarely be satisfactory elsewhere.

Ideally, a storage rack makes use of every available inch of capacity yet allows ready accessibility to each item. Columns, for example, are seldom placed with an eye to fitting between the racks; the racks must be fitted around the columns. Thousands of cubic feet of valuable space are lost in many warehouses by rack designs that are too rigid to fit closely around and between such obstacles. Stacking heights must also be computed. The limits are set either by ceiling clearances or by the stacking heights of the trucks in use. If only two vertical feet are lost in a warehouse of 200 ft by 300 ft, 120,000 cubic feet of expensive storage space is being wasted.

Aisle widths must vary from one warehouse to another to accommodate the turning circles of different trucks. Some trucks require as much as 12 ft while one current design needs but 6 ft. Finally, the bays in which the merchandise is stored should have an absolute minimum of 3 in. and preferably 6 in. clearance on each side to allow for careless approaches by truck drivers.

Structural engineering of the primary rack elements must provide adequate strength to carry the load, yet not use unnecessary steel that increases costs. Not only must the weight of the merchandise be calculated, but the number of loadings needs to be considered. Shocks from repeated dropping of heavy loads can cause failure from fatigue. Dynamic loading, then, requires greater strength than the static loading of dead storage.

Rack design can increase structural strength without using more steel. Back-to-back pallet racks using common end frames, for example, lend support to each other and increase rigidity. Stringers, the horizontal members that parallel the aisles, vary in

width from 2 in. to 6 in. depending on the distances between vertical supports or end frames. These stringers can further be strengthened by the use of horizontal stiffening members or runners. Sometimes these runners serve also to support the pallets.

Storage rack systems vary greatly in the manner in which they are installed. As a rule, the manufacturer does not like to become involved in the installation, although he can usually make arrangements to have it done if the customer wishes. Usually the men who will operate the warehouse handle the installation themselves.

Whether they can do so readily depends on the form in which the rack elements are supplied and what remains to be done in assembly. For example, one storage system is supplied with welded platforms and welded end frames. These units are then readily bolted into continuous rigid racks of the prescribed length, depth, and height. By carefully engineering the entire system in advance, the final assembly is a simple matter.

Recently our company installed pallet racks in a large New York warehouse. Storage for 19,000 pallets was needed. To save steel some of the racks were built only two platforms high instead of three. In all cases, however, merchandise was stored four pallets high. This meant that two pallet loads were placed on top of the two-high racks, only one on top of the three-high racks. Direct accessibility therefore, was not possible to the lower pallets on the two-high racks; the top pallet must be lifted down, the bottom pallet lifted down, the first pallet picked up again and placed on top of the rack, and finally the second pallet picked up for delivery.

Fig. 2. At Baker & Adamson warehouse in Marcus Hook, Pa. When racks only one platform high are used, the pallet supports rest on top of the vertical support as shown here. This design easily can be adapted to racks that are several platforms high by attaching pallet supports directly to sides of the vertical members

This procedure increases the time involved to select a load and requires additional men and trucks. However, if this occurs in a bulk dead storage area of like product, there is no appreciable harm or waste of manpower.

A recent rack design that is finding wide application in many industries is based on the gravity-feed principle with cases stored on-the-bias. This design is shown in Fig. 1.

Because picking from broken cases is easy, these racks are particularly popular where large numbers of small units are stored and where a variety of merchandise is needed to fill an order.

Inventory control is facilitated because the racks are filled from the back, picked from the front. Not only is a constant turnover assured, but a glance shows the current stock of any item. Platforms can be added to the top of the racks for dead storage or for storage of slow-moving items.

This type of rack is additionally interesting because in a sense it is a forerunner of the warehouse-of-the-future. Harry Meserole, one of the few engineers whose full attention is devoted to warehouse design, predicts that eventually warehouses will be so constructed that the entire structure is built on an inclined plane. Loading on the high side will be direct from railroad cars that will load the warehouse perhaps a mile long, direct from sidings.

Order picking will be from the bottom of the slide and stock control will be automatically computed by punch cards. While such an ideal warehouse certainly is well in the future, the conventional warehouse of today can enjoy some of these advantages with the gravity-feed storage racks now available.

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(Continued on page 214)

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Figs. 1 and 2. Plant clean-up campaigns resulted in the installation of cabinets specially designed for the storage of cutting tools, left. Catalog system, below, makes it possible to locate any tool quickly. Dies are being cataloged, too.

Good Housekeeping at Formica

Clean-Up Campaigns, Tool Catalog Bring Worthwhile Dividends

THOROUGHGOING plant clean-up and supplies conservation campaigns have substantially cut costs, increased production efficiency and significantly improved output per man hour at the Formica Company, Cincinnati, Ohio. On shop supplies alone, it is estimated costs have been cut between 30 and 40 per cent.

An important lesson of these campaigns at Formica, is the close correlation between work area cleanliness and good housekeeping, and work performance. Proof that it is more than a matter of less wasted time in looking for tools and parts is demonstrated by a comment of the company official who said, "When the bench is clean and neat, the man stationed at that bench has more pride in himself and his job. He wants his work to be clean, neat and efficient, too."

The plant conservation program began a little more than a year ago. To conserve supplies, a central committee from the standards department keeps control of material going to each department. The foreman of the department draws supplies sufficient to last about one month, and supervises their distribution. Employees are required to turn in used gloves, rags, and similar items before receiving new ones. Previously, each worker went to the supply room whenever he needed an item.

Some of the savings credited to the changed procedures in the supply department are: use of hydrometers cut by two-thirds; cost of rags reduced $1,500 a month; and "tons" of kraft paper used in production operations, which were formerly scrapped, are now salvaged and reused.

Tool Damage and Loss

When the housekeeping campaign began, "a pretty unsatisfactory condition" existed at the Formica plant, according to Harry Wieck, foreman of the industrial fabricating department, who played a leading part in initiating the program.

Many of the firm's 1900 employees habitually cluttered the work tables with tools, rags, papers and personal belongings. More rags and papers lay in the aisles and under the tables. Street clothes would be hung helter-skelter from nails and hooks on nearby walls, or were thrown across machines and tables.

There was little enclosed storage space for tools not in use, and even less organization. As a result, damage and loss of tools were prohibitive, and there was a heavy drain on the supply room for replacements.

First step taken, aimed at improving cleanliness and neatness of the plant was the purchase of several storage containers. Additional lockers were also obtained for personal belongings, since the number already provided was insufficient. In one of the two buildings comprising the plant, separate locker rooms were either not available or were difficult to reach, so the new units were backed up against unused wall areas, or placed around the perimeter of departments.

Other containers, adapted in the shop, were acquired for tool storage. Wheeled carts and boxes for holding various kinds of scrap were stationed at strategic points throughout both plants. A slotted wood box was used for scrap paper collection; 50-gal drums were used as receptacles for dirt and miscellaneous refuse; and metal bins, measuring about five feet high, wide and deep, were designated for the collection of kraft paper.

Largely because of its operations, the machine shop was one of the biggest housekeeping problems in the company before the program started. The work there consisted of producing parts of innumerable sizes and shapes from Formica sheet, rod, tubes and bars. Each time a job was changed, a host of machine tools, including cams, cutting tools, dies, tool holders and collets, had to be changed.

Tool Catalog

Formerly, these tools lay around anywhere and everywhere a space could be found for them—under tables, on top of tables, on machines, in tool boxes, and hung on the walls. On some orders, machine tool damage cost amounted to $10 or $12, according to Foreman Wieck. This might represent as much as 80 per cent of the tool cost of the order. In addition to these losses, it might take a workman one or two hours to locate the cams necessary to produce the order on his machine.

Now, cutting tools are stored in specially-designed cabinets located in a tool crib. With the use of a card catalog system, any tool can be located within a few minutes. Cams and collets are stored within the machine shop, in shop-adapted lockers. Cams are hung on pegs in the lockers, while Formica plates, inserted in drawer runners, hold the collets upright in holes drilled in the plates for this purpose. Dies, now being cataloged, are stored on open shelves.

The key to the success of the programs is inspection, which takes place once a month, without advance notice. Inspections are conducted at present by the company safety director, John L. Shear. He makes the rounds of each department accompanied by its foreman. This arrangement enables Shear to explain in detail the reasons for any penalty assessed, and at the same time gives the foreman an opportunity to point out mitigating circumstances. Perhaps a machine looks sloppy because it is being overhauled at the time of the inspection, or containers are waiting to be emptied, making it necessary to pile rags or scrap on the floor temporarily.

Each department is checked on 23 points such as: aisles; proper stock storage, clean and orderly cabinets; area free of unnecessary objects; machine guards in use; clean and neat work benches. For each item, the department is rated good, fair, or poor on a points system. Aisles kept clean and clear, for instance, would receive a "good" rating, and 10 points. A less well-kept aisle would receive a "fair" rating, and four points. "Poor" ratings get no points at all, while if the department is perfect, it will score 100 points.

When the inspection is completed, each foreman receives a report of how his department was rated. Copies of the report are also sent to the foreman's superintendent and the plant manager. It is then up to the foreman to correct any deficiencies uncovered by the inspection. Failure to do this usually results in a conference with the plant manager, but there have been few such cases. The desire to keep things ship shape has spread to every part of the plant, and, although every department doesn't receive a perfect rating at every inspection, any evidence of poor housekeeping is corrected in short order.

Both the housekeeping program and the conservation campaign were initiated by department foremen, who are affiliated with the National Management Association. The company believes that the presence of this forum was vital in the success of the programs, since the club provided a place, at the management level nearest the trouble, where solutions could be worked out. Too often, difficulties on the production line must be settled at a higher level; this creates communication difficulties which reduce the effectiveness of the solution.

Company sales in 1954 were seven per cent above the 1953 level, but net profit was up 47 per cent. Credit for this whopping dividend goes largely to the savings wrought by the clean-up and housekeeping drive.

THE FORMICA COMPANY

HOUSEKEEPING RATING SHEET

Score _____

Department _____ Foreman _____ Date _____

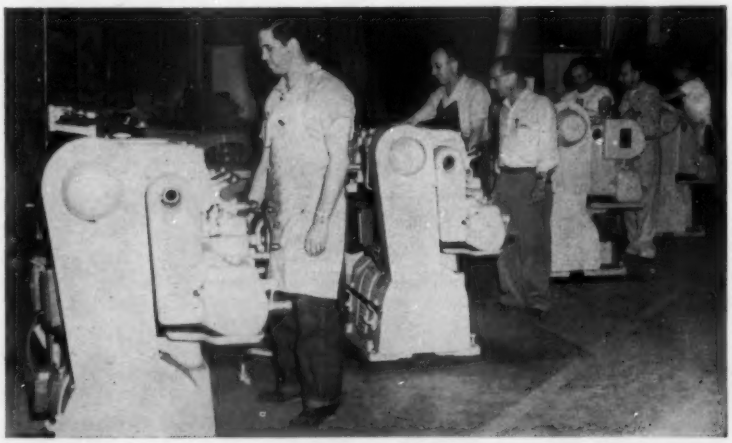
		Good	Fair	Poor	Comments
1.	Main aisles marked and observed	7	3	0	
2.	Department aisles clear	5	2	0	
3.	Fire doors & equipment clear	4	2	0	
4.	Safe passage to emergency exits	4	2	0	
5.	Stock storage	5	3	0	
6.	Storage of material in use	4	[illegible]		
19.	Employee clothing (proper area)	2	1	0	
20.	Desk - Foreman and Supervisor	2	1	0	
21.	Proper machine guards in use	4	2	0	
22.	General appearance	4	2	0	
23.	Apparent housekeeping effort	6	3	0	

Notes _____ Score _____

Excellent 100
Satisfactory 90 to 100
Unsatisfactory

Fig. 3. This form is completed by the safety director on his monthly housekeeping inspection tours. 100 is top score. A score less than 90 is unsatisfactory

Fig. 4. Clean floors, spotless machines and neat appearance like this are a result of careful housekeeping, contribute to productivity of any department



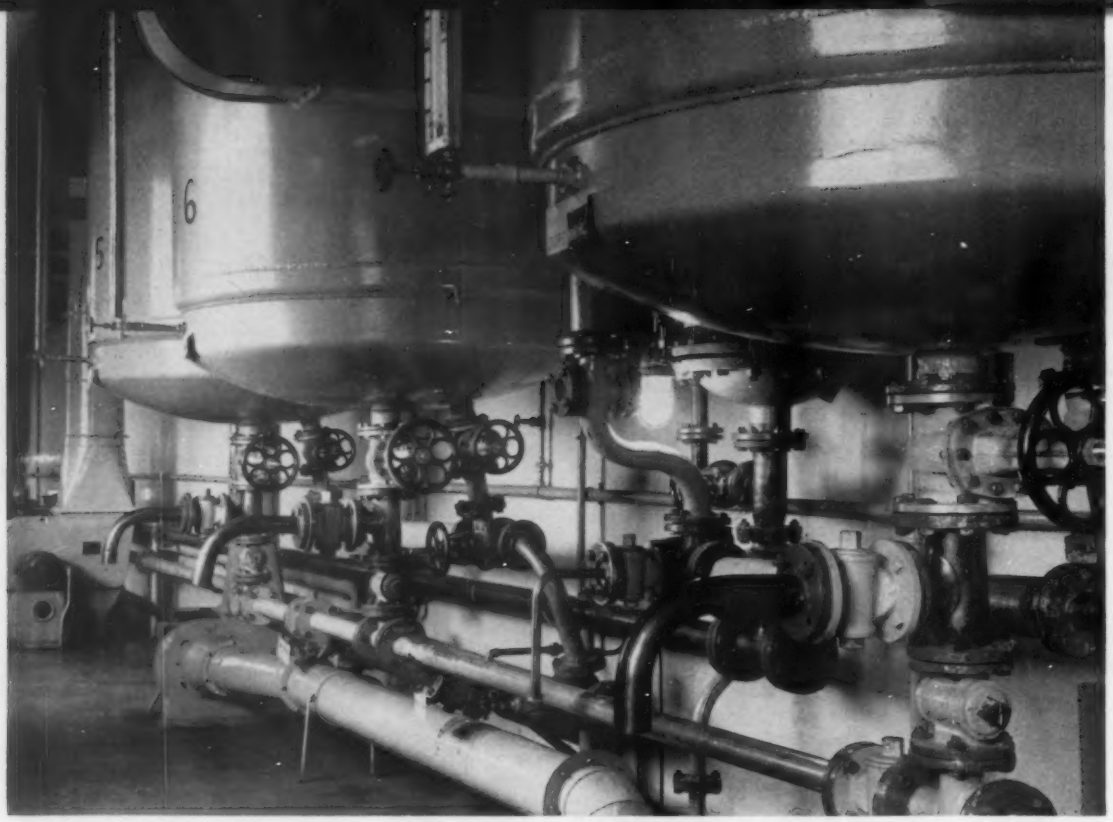


Fig. 1. The maze of piping, valves and equipment shown here illustrates the need for standards at the Ansco plant

Maintenance, Construction Standards—

How Ansco Uses Them to Cut Costs, Improve Quality

By H. A. BURNS, Manager, Production Engineering Dept., Ansco
A Division of General Aniline & Film Corp., Binghamton, N. Y.

ANSCO IS A LARGE, light-chemical plant employing about 4000 people. We manufacture a complete line of photographic film, papers, chemicals, cameras and accessories. Duties and functions of the Engineering Department at Ansco are, in general, similar to those of most chemical plants. In order to clarify the discussion of standards for construction and maintenance in our particular plant, however, I would like to pinpoint these responsibilities and functions of our engineering department:

1. It provides new buildings and equipment, or alters present facilities to meet production requirements.

2. Maintains the present buildings and equipment in good condition.

3. Maintains an adequate stock of construction and maintenance materials. Our mechanical stores stock, for example, is valued at about $90,000. There are more than 6800 items set up on Cardineer cards, each with established maximums and minimums. This stock is turned over about twice a year.

4. Provides and maintains the energies required for operation of the plant. This includes the generation of steam and about 90 per cent of our electric power. It provides well water, distilled water, hot and cold service water, refrigeration, air conditioning, inert gas, etc.

You will note that these duties and functions vary widely from the functions of a product engineering department in a metal working industry. I wish to emphasize that the Engineering Department at Ansco does not design or specify the product; and the standards discussed in the article, in general, do not cover any material which goes into the product, that is, chemicals, packages, spools, foil wrapping, camera parts, etc. These are manufactured according to standards established by the Product Standards Department.

The Engineering Department of Ansco does practically all the maintenance, with its own staff, letting out on contract large painting jobs, road repairs and some major overhaul of production equipment such as punch presses at the Camera Plant. Also the Engineering Department designs, fab-

Fig. 2. Standardized materials, too, play an important part in low maintenance costs and high production at Ansco

A paper on this subject was delivered by Mr. Burns at the Fourth Annual National Convention of the Standards Engineering Society, Hartford, Conn.

ricates and builds a large part of the film and paper sensitizing and processing equipment, as this equipment is not commercially available. We also do most of our own building design, including air conditioning, elevators, and other building equipment. As our buildings are functional with our product, we have found it advisable to do our own building design, supplementing our designers with hired men as needed.

Engineering Personnel

To do the large amount of designing, fabrication, construction and maintenance work we have about 360 employees in the Engineering Department. The personnel of this department includes engineering supervision, engineers, designers, draftsmen, development and instrumentation groups, mechanical stores, shops, energies, janitors and elevator operators.

Photographic film and paper, in addition to being sensitive to light, is sensitive to many fumes and materials. To illustrate this, when one of our film coating machines was constructed during World War II, we encountered many difficulties in obtaining the large number of types and sizes of materials which were required, so several "off-the-cuff" decisions were made on substitutions in an effort to get the job done.

How Things Go Wrong

For example, our standard for plug cocks in the emulsion lines called for Type 316 stainless steel bodies and hardened Type 420 stainless steel plugs. At that time Type 420, in the size required for the plugs, was on very long delivery so Type 440 was substituted. In general, the higher the chrome content of stainless steel the more resistant it is to the mixture of chemicals used in our emulsions. So it seemed like a proper decision at that time and not too much thought was given to it. Upon the completion of the machine many months later the level of fog on the film produced was much higher than on the other coating machines. After considerable searching and exploding many theories, it was noted that the plugs of the plug cocks showed signs of corrosion. A quick check was made and it was found that the corrosion products from the plugs were causing the high fog.

To be sure that all materials that go into the production areas are safe, samples are checked by our Raw Material Quality Control Department. This covers such materials as paints, detergents, floor covering, new types of insulation, etc. Many brands of these products give off fumes that would adversely affect the product although it may not come directly in contact with it. Also these items must be rechecked from time to time as the manufacturers change formulations without notice. Paint manufacturers are very prone to do this.

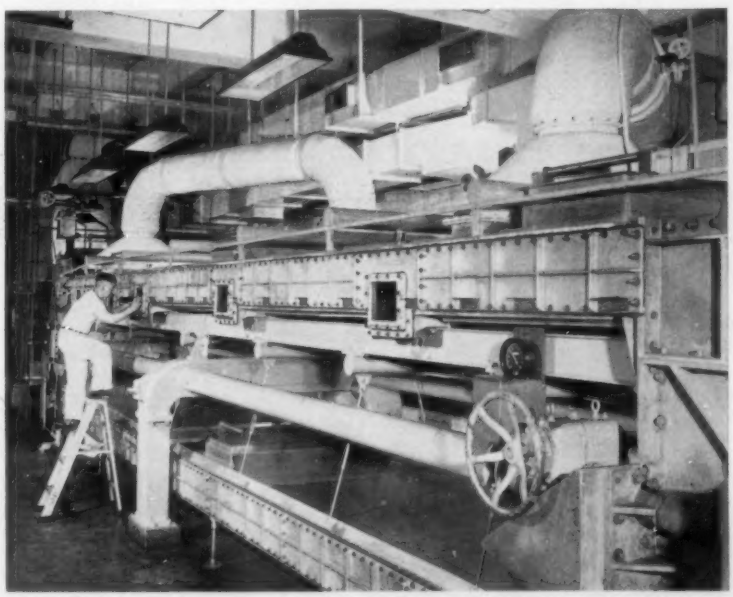
Fig. 3. Valve standards are particularly important at Ansco. At this standards conference are, left to right: R. J. Berstler, Shop Superintendent; A. F. Schmidt, Manager, Energies and Electrical Engineering Department; H. A. Burns, Manager, Production Engineering Department; J. C. Potts, Standards Engineer; J. A. Ries, Foreman, Pipefitting Shop; W. A. Robinson, Supr. Engr. Equipment Design Dept.

All this may seem rather far afield from the subject of standards but many of the standards at Ansco must take into account the effects the material will have on its very sensitive product. On the other hand, a large part of our standards could be used by any Plant Engineering Department in building and maintaining the usual chemical plant.

Our standards cover not only materials for construction and maintenance but also for air conditioning ducts, safe lights and several other types of equipment. We have many other standards under consideration which we hope to incorporate at some later date. There seems to be no end

(Continued on page 214)

Fig. 4. Another piece of equipment—this one in the film casting department at Ansco's Binghamton plant—typifies the modernity and cleanliness of the processes



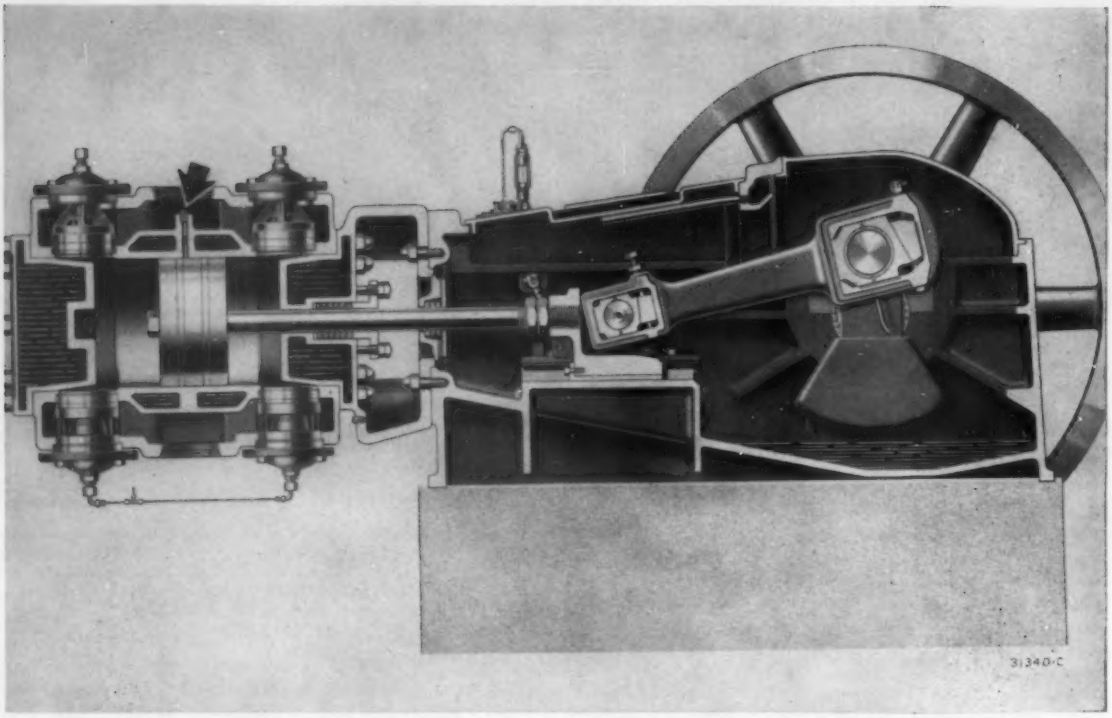


Fig. 1. The piston in this double-acting compressor design gets lubricant through opening at cylinder mid-point (arrow)

Air Compressor Lubricants—

Proper Choice and Application Help Prevent Explosion

TOO LITTLE OIL can ruin an air compressor, but too much, especially if it is the wrong kind, can build carbon deposits that are potentially explosive. To be safe, follow the advice of a reliable oil company and then make certain no carbon deposits build up in the compressor or piping.

Regardless of the make, construction, and operating conditions, lubrication of reciprocating-compressor cylinders resolves itself into protection of the piston, cylinder walls, piston rod and valves. The oil must not only minimize wear and reduce friction, it must also provide a seal between piston rings and cylinder walls. Effective lubrication can be obtained only when the cylinder-wall temperatures are low enough to preclude vaporization of the oil film, yet not so low that condensed moisture will wash away the lubricant.

Oil feed generally goes to the cylinders through one or more pipes leading from separate elements on a multiple force-feed lubricator. These pipes, fitted with check valves, connect to the cylinder bores, and, as the pistons pass, the oil is gathered up and carried between the piston rings to serve for lubrication and as a seal against leakage. The force-feed lubricator assures a controlled flow of oil under pressure to each cylinder and, if properly adjusted, eliminates the possibility of overfeeding because the oil feed starts and stops with the compressor. Lubricators are not affected by variations in air pressure and will feed at the desired rate according to their adjustment, the compressor speed, and the oil viscosity.

It is not easy to establish a hard and fast rule in regard to the theoretically proper amount of oil that should be supplied to an air-compressor cylinder. There are too many variables involved, such as the size of the machine, its speed, condition of the piston and cylinder walls, and the amount of dirt in the air. The oil will probably remain in an air-compressor cylinder considerably longer than in the cylinders of either a steam or internal-combustion engine, because there is less atomization and little or no washing action or dilution of the oil film.

A rule for general guidance suggests that from 1 to 2 drops of oil per 500 to 1,500 sq ft of cylinder area covered by the piston per minute should assure adequate protection. However, the size of the drops varies with the viscosity, temperature, service conditions, diameter and shape of the lubricator orifice, and the type or design of the lubricator. Also, the number of drops per pint will vary. As a result, the number of drops secured per minute from an oil having a Saybolt viscosity of 200 sec at 100 F would differ from the number obtained from an oil of 300-sec. viscosity.

Two compressors of the same design and size, built by the same manufacturer, may be operating in a room under identical conditions. Yet, it will be practically impossible to have the same piston-ring and valve fit and the same polished cylinder surfaces in the two machines, and they may require a surprisingly different amount of oil for lubrication. Any increase in the feed above that necessary to provide an effective piston seal and reduce friction to the minimum tends to increase carbon deposits and the danger of fire and explosion. Since so many variables enter into the picture, the Compressed Air & Gas Institute recommends that

the minimum allowable feed under ideal conditions should not be less than that given in Table I.

Table I. Recommended lubricating oil feeding rates for compressor cylinders

Cylinder Dia. in Inches	Piston Displacement per cyl., cfm	Swept Surface per cyl. sq ft/min	Oil Feed per Cylinder	
			Drops per min	Pints per 10 hr*
Up to 6	Up to 65	Up to 500	2 d in 3 min	0.05
6- 8	65- 125	500- 750	1	0.075
8-10	125- 225	750-1100	4 d in 3 min	0.10
10-12	225- 350	1150-1500	1- 2	0.112
12-15	350- 600	1500-2000	2- 3	0.188
15-18	600-1000	2000-2600	3- 4	0.262
18-24	1000-1800	2600-3600	4- 5	0.338
24-30	1800-3000	3600-4800	5- 6	0.412
30-36	3000-4500	4800-6000	6- 8	0.525
36-42	4500-6500	6000-7500	8-10	0.675
42-48	6500-9000	7500-9000	10-12	0.825

*Figures are based upon 8,000 drops per pint at 75 degrees F.

Mineral oil that is especially refined to resist the effect of temperature and that has the volatile elements thoroughly removed is necessary. This oil should have the correct body and characteristics to meet the requirements of the work. It should neither contain compounds that will cause gumming of the valves, or sticking of the piston rings nor those elements that will carbonize and necessitate frequent cleaning.

Oil too heavy in body will not spread readily over the rubbing surfaces. There will be some drag on the piston, resulting in excessive friction loss and air leakage, because the oil film is not complete. Furthermore, impurities in the intake air will more readily cling to the heavy oil and bake into a carbonaceous deposit on the piston and discharge valves. If the oil is too light in body and is used in excess to form a satisfactory film, much of it will be carried over into the intercoolers and receiver. Carbon deposits on the discharge valves interfere with their operation to such an extent that they fail to close completely or quickly enough. This condition permits the leakage of air back into the cylinders where recompression causes additional heating.

Distilled petroleum oils, being complex chemical compounds or mixtures, have a range of boiling points. The lowest boiling point occurs at a far higher temperature than the flash point for any given oil. A high-grade compressor oil boils at 782 F and flashes at 385 F. Slow evaporation takes place at any temperature and the rate of change from a liquid to a gas depends on time, temperature, and chemical composition.

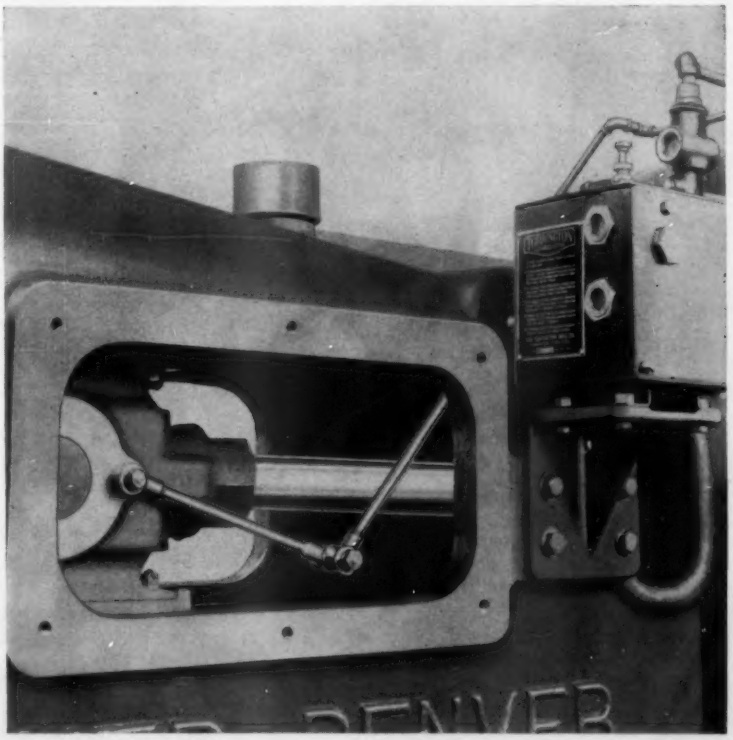
This theoretical evaporation cannot occur under normal operation because of water jacketing, cooling effect of intake air, the relaying of a new oil film at each piston stroke, and the fact that high temperatures occur only toward the end of the stroke. Since the discharge valves are in the path of the hot discharge air and represent the hottest part of the compressor, oil evaporated on the cylinder walls could not condense on them. The presence of liquid oil on the hot valve surfaces proves that no great amount leaves the cylinder as a gas and that carbon deposits come from this liquid oil adhering to the valve. Leaking discharge valves quickly reach temperatures that quite possibly can exceed the highest flash point of any lubricating oil in existence, and may cause the carbon deposits to become incandescent.

However, to use a wholly distilled oil is not always practicable. In marine air compressors or those installed in salt-air localities, a small amount of fixed or animal oil, such as lard oil, must be added to develop a lathering effect with moisture and prevent corrosion during stand-by service. By adding this oil it is possible to maintain lubrication with normal oil feeds; otherwise, were a straight mineral product used, the drops per minute would have to be increased. Even so, there would be insufficient lathering or emulsification with moisture to assure a protective film that would remain on the contact surfaces when the machine is shut down.

Either procedure will in time lead to increased residual deposits. On vertical or marine compressors in damp atmospheres this is, however, of less importance than positive lubrication. Nevertheless, any fixed-oil compound should be used as sparingly as possible, for fixed oils are not subject to distillation under normal conditions. Instead, they may break down or decompose to a tarry or gummy residue when exposed to high temperatures.

All lubricating oils will be subject to more or less fractional distillation or separation under high temperatures. As this continues, the lighter portions evaporate and are carried off with the discharge air, the heavier fractions meanwhile remain in the cylinder or

Fig. 2. Force-feed lubricator assures positive flow of lubricant to cylinder



collect in the heads or on the valves.

Because of the wide variation in factors influencing selection, it is possible to establish only the minimum or maximum (as the case may be) permissible limits of general requirements for air-compressor cylinder oils. Values recommended by the Compressed Air & Gas Institute are given in Table II. Two representative oils, both

Table II. Cylinder Oil Requirements

Flash Point, deg F	350 min
Visc., SSU 100 F	245 min
Visc., SSU 210 F	45 min
Pour Point, F	+35 max
Neutraliz. Number	0.10 max
Conradson carbon residue	20% max

falling within the limitations outlined in this table, and both suitable under certain conditions for compressor cylinder lubrication, may have physical characteristics as given in Table III.

Carbon residues are caused by exposing lubricants to direct heat. This involves a chemical change in their structure. If this heat is sufficiently intense, it causes abnormal vaporization of the more volatile constituents to result in an accumulation of non-lubricating matter which may be of a tarry or gummy nature. Continued exposure of the latter to heat causes coking or baking in piston-ring grooves and on valves. The cleaner an oil will vaporize, the lower will be the amount of objectionable residue. Normally, carbon residue will vary directly with the body or viscosity of an oil, as well as with the flash point. A wholly distilled compressor oil such as is used for normal conditions should show a carbon-residue content well below 0.50 per cent by the Conradson test.

Packed accumulation of carbon lying in piping and other pockets in contact with concentrated oxygen found in compressed air can, under certain conditions, ignite from spontaneous combustion. The fact that fires and explosions have occurred in compressed air systems cannot be overlooked.

Bureau of Mines experiments, conducted to learn why compressed air systems explode (Report Number 4465, U. S. Supt. of Documents) indicate that a carbon-oxygen complex is formed on carbon deposits in compressors and piping. The theory of the existence of such a complex, the formation of which is exothermic (giving off heat), has long been accepted as the explanation of the spontaneous heating of stored coal, as well as playing a part in other reactions involving carbon and oxygen.

Oxygen and carbon possess a strong affinity for each other, even at ordinary temperatures. The formation of a solid carbon-oxygen complex as a result of the union is a generally accepted theory. The oxygen is held in this complex by an attraction much greater than physical absorption. Tests have shown that oxygen unites with carbon at ordinary temperatures. Oxygen so united cannot be removed as such from the carbon, but appears mainly as carbon dioxide and carbon monoxide. The carbon-oxygen complex is stable at ordinary temperatures and breaks down into the gaseous oxidation products only under the influence of increased temperature.

There is substantial evidence that both formation and decomposition of the complex may take place simultaneously at various points on the carbon surface under certain conditions of temperature. The net result of the reactions involved in the formation of the carbon-oxygen complex is the evolution of heat.

The exothermic properties exhibited by such a complex are considered significant in relation to the possible initiation of combustion reactions that may lead to explosions or formation of carbon monoxide in compressed-air systems. The existence of this complex on air-compressor carbon is significant, as formation of the complex

Table III. Properties of Oil Samples

	Sample A	Sample B
Flash Point, deg F	365	410
Fire Point, F	410	470
Visc., SSU 100 F	312	403
Visc., SSU 210 F	48	59
Pour Point, F	—25	+25
Neutraliz. Number	0.02	0.04
Carbon Residue, %	0.04	0.40
Gravity, deg API	20.4	24.0

Oil characteristics data—Courtesy, The Texas Co.

may act as a source of ignition at rather low temperatures. It is evident that once an exothermic reaction is initiated, combustion of oil films or carbon deposits would proceed at a rapid rate under the condition of high partial pressure of oxygen that exists in a compressed-air system.

Air compressor carbon deposits studied by the Bureau of Mines exhibited the following characteristics:

1. Heating the carbon causes evolution of carbon dioxide and carbon monoxide in essentially constant proportions throughout a given range of temperatures.

2. Carbon dioxide and carbon monoxide were not evolved by the carbon until it was heated to a certain temperature, indicating that the complex is stable below that temperature.

3. When the carbon was heated in a stream of air, oxygen was consumed coincidentally with the evolution of carbon dioxide and carbon monoxide, indicating that formation and decomposition of the complex occurred simultaneously. The net effect of these reactions was measurably exothermic.

4. Heating of the carbon in an atmosphere of inert nitrogen caused decomposition of the complex into carbon dioxide and carbon monoxide. The rate of decomposition was essentially the same, whether the carbon was heated in air or in nitrogen.

5. Decomposition of the complex in an inert atmosphere involves endothermic (absorbs heat) reactions. No free oxygen is liberated when the carbon is heated in an inert atmosphere.

6. On heating the carbon in a stream of air, the oxygen accounted for in the effluent gases exceeds the oxygen content of the entering air stream, indicating that the complex was present on the carbon as a result of previous contact with air in the compressed-air system.

The over-all thermal effects produced by formation of the complex is carbon plus oxygen equals the complex and heat. Decomposition of the complex by heating produces carbon dioxide and carbon monoxide.

Results of the several experiments made by the Bureau of Mines indicate that the start of exothermic reaction begins at a temperature of about 482

Operating Rules to Prevent Explosions

1. Use only a high-grade compressor oil in the air cylinders, and feed the minimum amount that gives satisfactory compressor lubrication.

2. Maintain the air filters in good condition to prevent dust and dirt entering the air cylinders.

3. Clean the intercoolers and cylinder jackets at regular intervals according to a schedule dictated by local water conditions.

4. Assure a good cold supply of cooling water for the intercoolers and aftercoolers. Cylinder jacket water can be slightly warmer, perhaps the discharge from intercooler.

5. Maintain tight air baffles and water partitions in intercoolers.

6. Make periodic inspection and regrind or replace valves and springs as needed.

7. Periodically clean all air passages between the cylinders and receivers, and also pistons and piston rings.

8. Maintain accurate intercooler gages so that abnormal intercooler pressures may be noted and abnormal conditions corrected.

F. The accompanying set of curves, Fig. 3, compares this temperature to that calculated for adiabatic (constant heat), single-stage compression with different compression pressures and intake air temperatures. This temperature of 482 F is about the same as that of the compression temperature developed by a single-stage compressor operating at a gage pressure of 100 psi with 60 F intake air. The same condition would exist at lower compression pressures and higher intake-air temperatures.

Excessive temperatures in a compressor may be caused by any one or more of the following faults: 1. an inadequate supply of cooling water; 2. cooling water too hot to permit proper heat transfer from the air to the water; 3. intercoolers and jackets blocked with dirt, mud, and scale, preventing heat absorption by the water; 4. air baffles in the intercoolers broken, permitting the air to short-circuit to the discharge with very little heat removal; 5. partitions in the waterheads of the intercoolers not tight, permitting the cooling water to short-circuit between the inlet and outlet without passing through all intercooler tubes; and 6. leaking valves or piston rings that permit re-entry of compressed air to the cylinders.

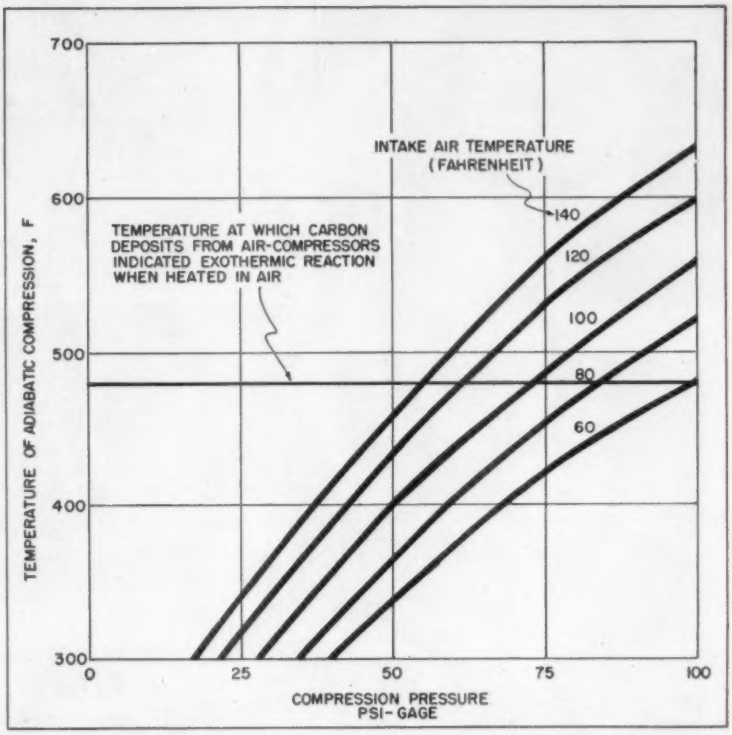
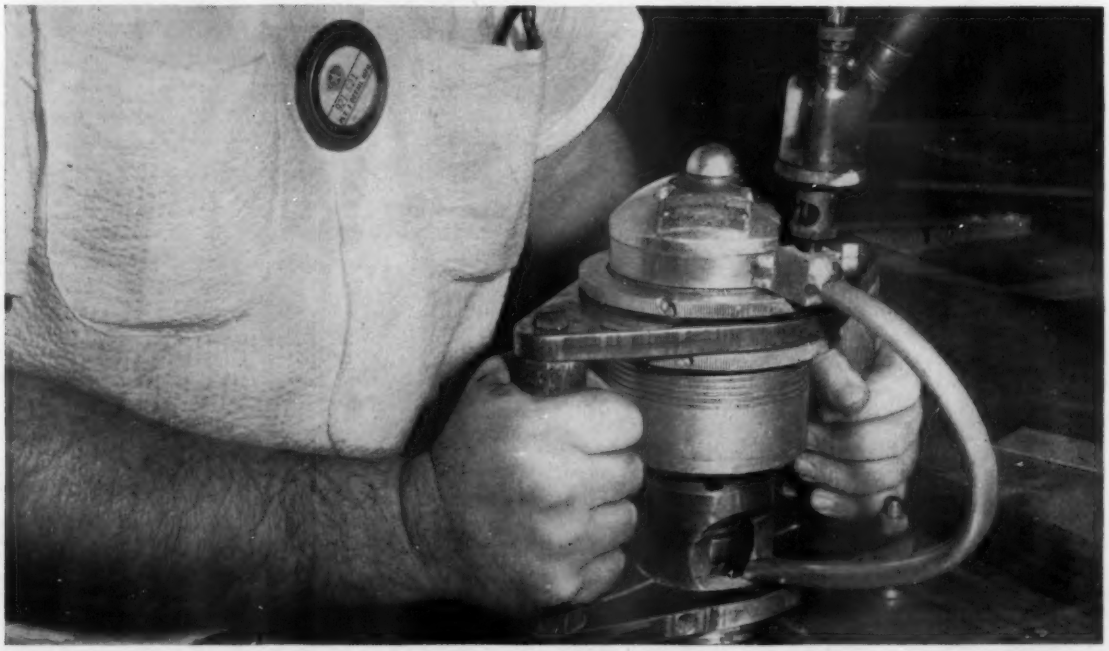


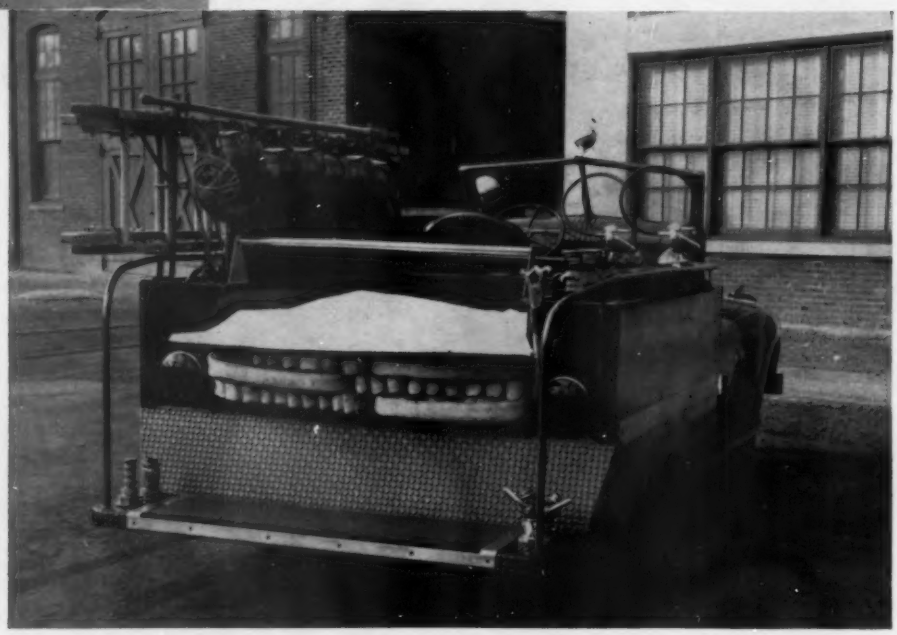
Fig. 3. Chart presents combinations of intake temperatures and adiabatic compression pressures in relationship to the exothermic reaction temperature line

Martin Puts Tool Exhaust Air to Work



This labor saving idea has been put to use at the Glenn L. Martin plant in Baltimore, Maryland. It eliminates two hand operations, cutter lubrication and chip removal. An air tube and fitting, equipped with a lubricator directs air from the router motor to the cutters. Oil entrained air removes metal chips and applies lubricant simultaneously

Photograph at left shows truck chassis as it appeared when purchased by Worthington for $150. Below: This is the fire truck when completed by the men of the Worthington Fire Department. Author Driscoll describes it as "the ideal equipment for our type of plant." Drawing on facing page shows construction details of truck



"Do-It-Yourself" Fire Truck

$150 Ugly Duckling Becomes Worthington's Ideal Fire Fighter

By GEORGE E. DRISCOLL, Chief, Plant Protection, Worthington Corporation, Harrison Division

IN A PLANT SUCH as Worthington Corporation's Harrison, N. J., Division, requirements for adequate fire equipment are broad and varied. In that plant we have paint shops, spray booths, paint and oil storage buildings, a blacksmith shop, welding and burning buildings, research, metallurgy and welding laboratories, garages, lumber storage facilities, an acetylene plant, a power house, carpenter shops, a shipping and receiving department, iron, brass and steel foundries, pattern shops, machine shops and huge pattern-storage buildings.

Therefore, from a fire engineering view, we have all three classifications of fire on a large scale.

Buildings are approximately 99 per cent sprinklered and we have an ample water supply plus two large Worthington fire pumps each capable of producing 1500 gpm at 115 psi.

Truck Chases All Plant Fires

Each building has adequate equipment to combat a small blaze but all fires do not start small. Flash fires and explosions are capable of destroying a building in a very short period of time. Therefore, even though it is a consolation to have plenty of equipment in a plant it can be considered as false security if it is not available at the scene of the fire.

Too often a minor blaze has developed into a holocaust just for the lack of an axe, gas mask, ladder, rope, extinguisher or other minor but important tool. We considered this fact and decided to design our own apparatus to meet our plant's requirements.

We did not want a large bulky rig, but one that could be easily maneuvered and low enough so that extinguishers and other equipment could be removed with ease. We did not want rear fenders either, as that would also hinder us and prevent us from having a streamlined body.

There are twenty-four hydrants distributed throughout the plant and each has a hose house containing a sufficient amount of 2½ in. double jacket hose to protect that area. We decided to equip our truck with 1½ in. double jacket hose as it is ideal for lead

BOTTOM VIEW OF
REINFORCEMENTS
FOR FLOOR PLATE
SHEET
METAL
A
A
5"
4"
4"
5"
16"
22"
16"
8'-0"
14½"
19½"
15½"
12"
37½"
12"
66½"
45"
24½"
24"
4"
13¾"
26½"
66½"
12½"
2"
18½"

lines, inside work and washing down; and it is very easy to advance. The size of ladder, number of extinguishers, and other equipment we considered necessary, was then decided upon.

Next, sketch was drawn of the body and with this information we went in quest of a used truck. A ¼ ton panel chassis for $150 was finally located and purchased.

First, Take It Apart

In order to utilize our own design it was necessary to remove the entire body of the truck. To accomplish this we removed the gas tank and then applied a burning torch to the body, stripping the chassis from cowl to tail light. Channel iron was inserted in the frame to add support and extra leaves were added to the springs.

The plant's metal scrap pile now became the center of activity. Diamond plate metal, ⅛ in. thick, was selected for the body. It was at this point that the ingenuity of Worthington personnel became evident. The fire department consists of sheet metal workers, pipefitter, welders, burners, electricians, millwrights, mechanics and woodworkers who are specialists in their own fields and who used their combined talents to produce an apparatus perfect, for our needs, in every detail.

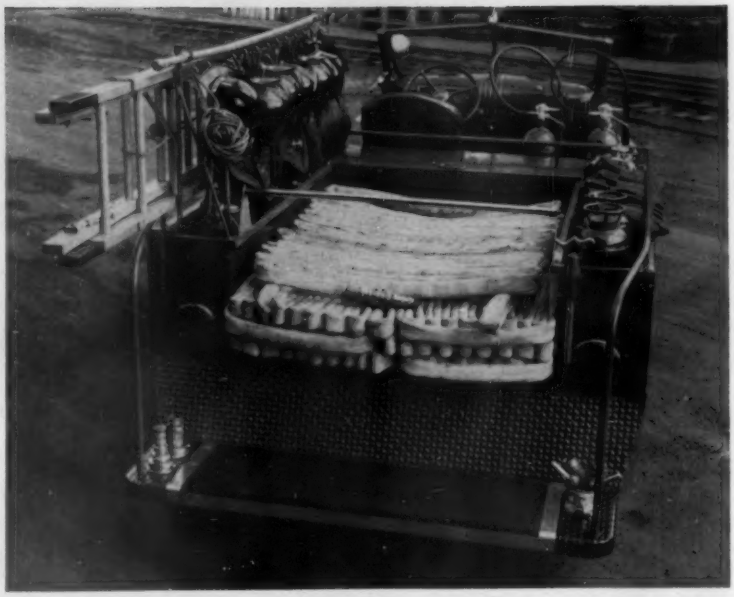
Front and sides of the body are one solid piece of metal rolled and rounded at the corners and welded to the bottom. Partitions were formed inside the body for extinguishers and other equipment. Then an equipment box was constructed and located directly behind the driver's seat.

Twelve ½ in. holes were drilled in the bottom of the hose bed at various locations to permit water drainage. Similar holes were made in each partition. The body was then placed on the chassis by means of an overhead crane and welded in place.

Then, Put It Together

Next, a framework of angle iron was welded to the body and this beds the ladder, pike pole, helmets, raincoats and hose rope tools. A front bumper and rear step were attached. Heavy construction was completed by the installation of a ¾ in. pipe railing encircling the body and descending to the rear step.

Final phase of reconstruction consisted of rewiring the vehicle. Two large tail lights were inserted on each side of the rear of the body. Then two spotlights were obtained from a used car lot, one of which was installed on the left side of the truck. A red lens was inserted in the other and it was mounted on the top of the windshield. An electrician promptly transformed it into a blinker. A siren



This rear view of the truck shows compact arrangement of the equipment carried. reventive maintenance of truck and equipment receives company's top priority

was then fastened to the rear of the front bumper. A brass bell was cast in our foundry and was installed to the left of the driver's seat.

Axe hangers were welded to the sides. Rubber mats were provided for the running boards and rear step. The gas tank was replaced on the chassis. A strip of stainless steel was attached to both sides for trim. Snow tires were mounted on the rear wheels and the apparatus was sanded down and driven to the paint shop.

First, a coat of primer was applied. This was followed by three spray coats of special fire-red paint, the truck being buffed down between each coat. Motor and blinker light were painted with aluminum paint and a month later the apparatus received its initial coat of hard wax polish.

Saddle soap is regularly applied to the leather on the driver's seat and a rubber preservative is used frequently on the mats and tires. Finally a wood latticework frame was placed in the hose bed and our task was completed.

Following is a list of the equipment we have on the apparatus: 700 ft of hose, 2 fog nozzles, 3 straight tips, 3 dry chemical extinguishers, 2 carbon dioxide extinguishers, 1 foam extinguisher, 1 anti-freeze, 1 gas mask, 1 electric lantern, 1 pike pole, 1 extension ladder, hydrant wrenches, spanner wrenches, hose rope tools; wye; three 2½ to 1½ in. adapters; 2 double male and 2 double female couplings, 1 axe, 1 shovel, 1 hux bar, 1 crow bar, 1 wrecking bar, 1 wire cutter, 6 pairs asbestos gloves, rope, boots, helmets and coats.

To insure dependable performance the apparatus is started three times daily and is run for a period of no less than fifteen minutes each time. The hose is hydrostatically tested annually and is repacked quarterly to change the position of the folds.

Apparatus and equipment receive the utmost care at all times. After a fire the rig is washed and spare hose and extinguishers replace the equipment used at the blaze. The dirty hose is scrubbed, hung up to dry and then placed in a cabinet as spare hose.

Each week the apparatus is washed. Wax polish is applied quarterly. Axe handle, pike pole and ladder are periodically sanded down, shellacked and varnished. Rubber dressing is used on the tires and matting when required.

This apparatus has rendered valuable assistance to us and with proper maintenance we can depend on it to protect our plant from the ravages of fire.

Coil had to be weighted with zinc slabs in order to sink it. Because of its height only half could be dipped at one time

Hard Lifting, Harder Lowering

Galvanizing Job Poses Two-Way Handling Problem

IF YOU HAVE BEEN complaining lately about some of the really difficult handling jobs you've been called upon to solve, take heart. Usually misery likes company, so read about the woes of one firm—The Southern Galvanizing Co., of Baltimore. They not only have a difficult time in lifting their work, they have even greater problems in lowering it.

One of the contract jobs they do regularly for Frick Co., Waynesboro, Pa., is the hot dip galvanizing of refrigeration coils. Some of these coils are moderately sized—in the 300 to 400 lb range. But every once in a while Southern gets a really big one, such as that shown in the photographs. The first time such a job came along it taxed the ingenuity and resourcefulness of the workers. But they licked it.

Nine Tons—Up and Down

Coils such as the one shown weigh 18,000 lb.—nine tons of fabricated metal which must be handled with extreme delicacy for fear of damaging either the product or the equipment into which it is being lowered.

As Harold R. Breslau, President of Southern Galvanizing puts it: "Most of the dangers inherent in putting such large objects into pickling tanks are brought about by the projections on the work. These can catch in troughs or ports and rip up portions of the heating elements."

Most job galvanizers know it is difficult to protect heating units at the bottom of pickling tanks because the tanks are of wood or acid-brick-lined concrete tanks.

To get back to the lifting and lowering: Nine tons of anything is a lot of weight but in a job galvanizing shop, not generally equipped to handle it, such mass and volume can really cause trouble.

Southern Galvanizing hires a 30-ton movable crane when such a job appears in their plant. The pickle tank, into which it is lowered, is 45 ft long, 5 ft wide, and 6 ft deep. The coils are pretty close to those dimensions.

In addition, the coils are attached to stands that have six 6 in. by 6 in. feet on them. These feet are what can cause trouble; they are difficult to guide and control when out of sight.

Once the crane has lifted the coils over the tank and partially lowered them into the pickling tank the problem of buoyancy comes up. In order to sink the coils—or at least the half that would fit into the tank—it is necessary to rig up some sort of weight. This has been accomplished by building up a steel frame on top of the coils, and than loading it with 11,000 lb of zinc.

When the pickling process has been completed on one side of the coils the zinc weights are removed, the coil is reversed and the process finished. According to Mr. Breslau, the first coil ever handled in this manner took 8 hr. The sixth coil took just 4 hr; the solution to the job, apparently, was experience.

Assembly of complete unit in plant of Frick Co. shows actual size of coils

TV's Take a Roller-Coaster Ride

Conveyors Link Assembly and Storage Operations at Sylvania

NEARLY 1400 finished TV sets in eight hours is the daily output at the new Sylvania television assembly plant in Batavia, N. Y. This production rate, capable of being increased to four sets a minute with present facilities, is attained in a plant designed specifically for TV production.

In essence, the plant consists of four continuous assembly lines, each independently supplied, scheduled and operated. However, since it was impractical to build and supply 700-ft assembly lines, the lines are subdivided into three operational segments. The segments are linked together by three 3-in. overhead trolley conveyors—engineered and installed by Lamson Corp., Syracuse, N. Y.—which feed streams of components from one production area to the next.

All Operations Conveyorized

All phases of the assembly and storage operations are conveyorized. Production areas receive the sub-assemblies for their operations at the time they need them and, as soon as their work is completed, dispatch the assemblies to the next succeeding work areas. The handling system is designed to transfer sub-assemblies between production areas directly and reduce intermediate storage to a minimum.

At the present time Sylvania is manufacturing approximately six different chassis models, which, combined with several variations in picture tubes and cabinet styles, make up a total of about 60 distinct production models. The conveyor system makes it possible to manufacture four models simultaneously on four independent production lines.

Before the entire material handling system is described, it might be well to relate it to the general production set-up. The main assembly areas, that is, chassis-build, process test and final assembly, are each subdivided into four independent lines. Since each line usually works on a different model, a color coding system was devised to make certain that components are routed and taken off at the proper place. Line No. 1 is designated by brown, No. 2 by red, No. 3 by orange, and No. 4 by yellow. Each carrier on the overhead conveyors is marked with one of these colors.

Thus, components that are destined for a model being assembled on line No. 1 are loaded only onto "brown" carriers. On the receiving end, the workers on line No. 1 will pick off from the overhead conveyor only those components on the brown carriers, and ignore the rest. The color coding system is in effect in all production sections, from sub-assembly right through to final assembly. It assures a smooth, uninterrupted flow of components to all work areas in spite of the complexities of supplying four independent assembly lines.

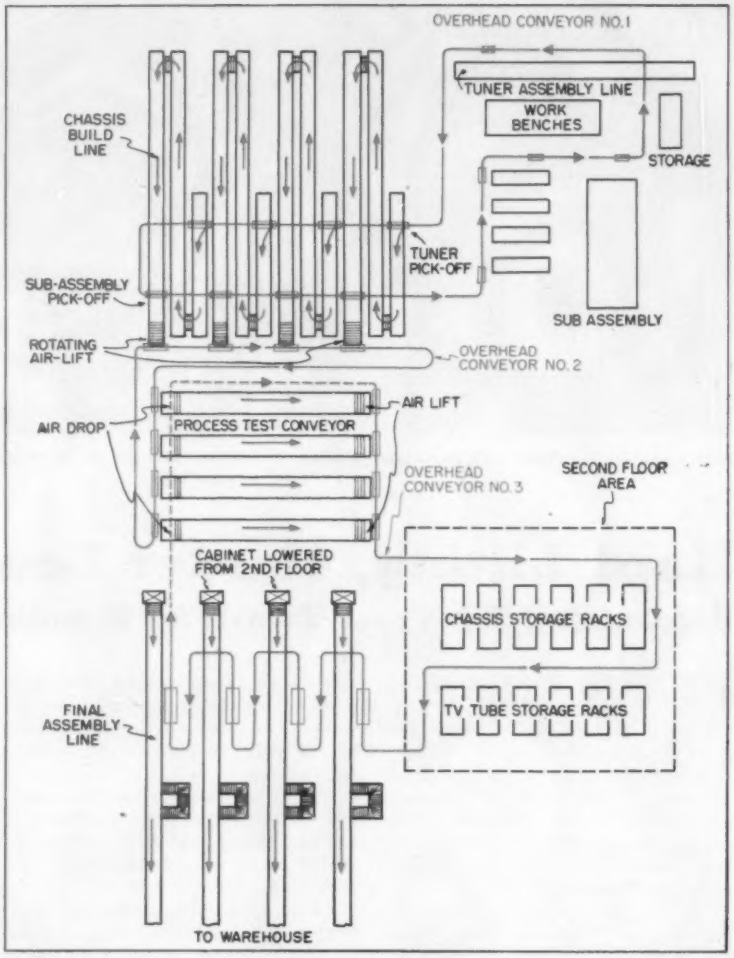


Fig. 1. Schematic layout of the TV assembly lines and the three overhead conveyors that link the three major production areas of Sylvania's Batavia, N. Y. plant

Figure 1 illustrates the material handling set-up that serves the two-story manufacturing plant. A TV set starts on its way in the tuner assembly area and sub-assembly area (which assembles yokes, power units and rectifier units) in the southeast corner of the plant. These operations are performed on parallel assembly bench lines, oriented north-south.

The first of the three overhead conveyors loops around through the two areas, picking up completed units for distribution to the chassis-build lines in the northeast sector of the building. The flat-bottom carriers, mounted on the chain at 2-ft centers, have a gross weight capacity of 30 lb each and travel 16 fpm. The 804-ft conveyor dips down at four loading stations in the sub-assembly area and at two sta-

tions in the tuner assembly area, bringing the carrier down to a 4-ft elevation to facilitate loading from the sub-assembly lines.

After the tuners and sub-assemblies are loaded onto the carriers of the appropriate color, they travel to the chassis-build area, where they are assembled into a fully wired chassis, minus picture tube. As previously mentioned, the chassis-build area consists of four independent lines, each line being composed of three parallel wire belt conveyors moving at 2 fpm.

The units start out at the head of the first conveyor line, moving along from worker to worker, each of whom performs a given set of operations until it reaches the end of the first line. The semi-completed chassis is then shunted across an 11-ft roller conveyor to the second belt, where additional work is done, and finally across to the third line, where the chassis is completed and given a preliminary inspection.

Features of Conveyors

Purpose of the first overhead conveyor is to deliver the units from the tuner assembly and sub-assembly areas to the precise points where they're needed on the chassis assembly lines.

Eight of the dips in the conveyor are composed of 3-ft radius bends, an unusually tight curvature for a 3-in. system. The power drive and chain-take-up required careful engineering in order to provide a steady pull on the chain, despite the rapid changes in load because of the sharp dips and rises in the rail. The conveyor is powered by a 1 hp variable speed caterpillar-type drive and is protected by a 90-degree chain-take-up and Maxitorq clutch to absorb possible overloads and surges.

When the completed chassis reaches the end of the third leg of the chassis-build conveyor, the operator transfers the chassis to a carrier on the second overhead conveyor using a roller-bed air lift specially designed by Lamson for the purpose.

The second overhead conveyor is 492 ft long and travels at 20 fpm. Carriers on this conveyor have a gross weight capacity of 122 lb and are mounted at 5-ft centers on the chain. The system is powered by a 1 hp variable speed motor protected by an overload clutch.

In the process test area the chassis are given a series of detailed performance checks as they move along on the conveyor line. The area contains four independent steel-slat conveyor lines, 100 ft long, moving at 28 in. per minute. As the chassis passes down the conveyor line, it is checked by operators stationed along the line. Any set requiring adjustment is pushed onto a work bench behind the conveyor where repairmen correct the difficulty and return the set to the test line where it is checked a second time.

Fig. 2. After reaching the end of the process-test belt line, the chassis are transferred to third overhead conveyor for delivery to second-floor storage area

When the chassis reach the end of the process test line, the last operator removes the test harness, disconnects the power plug and, using an air lift, Fig. 2, places the inspected set on a carrier of the third overhead conveyor system which passes across the end of the four test lines. This conveyor, about 1200 ft long, has the dual job of delivering inspected chassis to the second-floor storage area and of supplying units and tubes from the storage area to the final assembly section on the first floor.

When the conveyor reaches the second floor, which is primarily a huge storage area where chassis, picture tubes, and cabinets are kept until needed for final assembly, it moves along the perimeter of a rectangular chassis-storage area.

Adjacent to the chassis-storage racks is a picture tube storage area. When units are drawn from storage for final assembly, the chassis and matching picture tubes are placed on adjacent carriers on the overhead conveyor for transfer to final assembly.

The return side of the third overhead conveyor transports chassis and matching picture tubes to the four final assembly lines on the first floor. The color-code system is used to denote which of the four lines will receive these units. Operators on these lines transfer the chassis to benches and the tubes to temporary storage racks. The chassis receive a final test on the benches and are then placed on a length of roller conveyor for assembly in the cabinets.

Cabinets for these sets arrive from second-floor storage on a reciprocating lift which automatically discharges the cabinets at the head of each assembly line. Cabinets and chassis are sent from the second floor in a 1:1 ratio, the operation being coordinated by the foreman of the storage area. As the cabinets move along the assembly line, the speaker, picture tube, bezel and other hardware are installed. About midway in the line, the chassis are inserted. Before the cabinet is locked up, the entire set is checked as a unit; any necessary adjustments are made on a section of U-shaped conveyor that by-passes the main conveyor. The completed sets are packed while on the conveyor and then move directly into the warehouse where they are picked off the line by grab trucks and grouped for shipment.

Fig. 1. National delegates and alternates, representing over 1000 members, in attendance at second AIPE convention

Report on Second AIPE Convention

Delegates Plan Future Policy, Elect National Officers

ON JANUARY 22, 1956, the American Institute of Plant Engineers held its second national convention in Philadelphia. Last year 19 charter chapters were represented with a total of 558 members. This year, 28 charter chapters were represented with a little over 1000 members.

Delegates from the charter chapters met on January 22 to clear up business matters discussed last year and to formulate future policy. Members-at-Large were represented by R. S. Grant, of Owens-Corning Fiberglas Corp., Toledo, Ohio. Delegates approved the constitution and by-laws which had been discussed at last year's convention and altered during the year among the members of the Constitution Committee. They also elected new officers for the coming year.

R. W. Hiller, Plant Engineer, Dravo Corp., Neville Island, Pittsburgh, Pa., was elected president; R. F. McCaw, Director of Facilities Administration, National Broadcasting Co., Inc., New York, N. Y., was elected vice president; B. J. Drummond, Plant Engineer, Detroit Steel Products Co., Detroit, Michigan, was elected secretary; and T. S. Ramond, Construction and Maintenance Superintendent, Kroger Co., Chicago, Illinois, will serve as treasurer for a second term.

The various committee appointments were:

Constitution and By-Laws Committee: Paul Bowman, Whirlpool-Seeger Corp., St. Paul, Minn., will be chairman of this committee and will be assisted by C. A. Tingen (Piedmont)*, L. C. Mechling, Jr. (Pittsburgh), and W. D. Myers (Kansas City).

Financial Committee: T. S. Ramond will be chairman of this committee and will be assisted by J. B. Parchman (Dallas and Ft. Worth), and W. F. Bower (Philadelphia).

Membership Committee: W. R. Hodges, Kaiser Aluminum & Chemical Corp., Halethorpe, Md., will serve as chairman of this committee. A. W. Citro (Merrimack Valley), and F. McDermott (New York), will also serve on this committee.

Activities Committee: T. H. Hardgrove, Aerojet-General Corp., Azusa, Calif., was appointed chairman of this committee. The following men were appointed at a later date to serve on this committee: D. Smith (Dayton), E. F. Hanford (Calumet Region), C. R. Libby (Kentuckiana), J. J. C. Coffin (Boston), B. Kent (Gulf Coast).

Activities Sub-Committee—Research Coordination: D. Smith, The Duriron Co., Inc., Dayton, Ohio, will serve as chairman, and will be assisted by B. J. Drummond (Detroit).

Fig. 2. Officers presiding at convention, l to r: T. S. Ramond, treasurer; S. A. Simonson, secretary; R. H. Morris, president; and R. W. Hiller, vice president

* In the list of committee members, the designation following the names indicates the chapter in which the individual holds a membership card—company connections and other data will be found in the new AIPE Directory of Plant Engineers Organizations which has been sent to all members.

Fig. 3. Bob Hiller, newly elected president of AIPE, speaks at the All-Engineers' Luncheon

Fig. 4. Armed Services' speakers on the luncheon program check over program with Fred Richardson, President of the Greater Philadelphia Plant Engineers' Club. Left to right: Captain E. J. Peltier (Navy); Oscar Graveley, Department of Defense; F. Richardson of John Wanamaker; Brig. Gen. K. R. Barney (Army); and Colonel J. E. Gill (Air Force)

Activities Sub-Committee—Program Assistance: E. F. Hanford, Lever Brothers Co., Hammond, Indiana, was re-appointed as chairman of this committee. S. A. Simonson (Northern Illinois) was also re-appointed to assist him.

Publicity Committee: R. H. Morris, PLANT ENGINEERING magazine, Chicago, Illinois, will serve as chairman of this committee. He will be assisted by J. M. Weeks (Los Angeles) and F. B. Richardson (Philadelphia).

During the past year the following men were elected Regional Vice Presidents: John Waligora, Sharp and Dohme, Div. of Merck & Co., Inc., Philadelphia, Pa., will represent the Northeast Region; W. S. Duncan, Tobin Packing Co., Rochester, N. Y., will represent the East Central Region; E. N. Potter, International Harvester Co., Milwaukee, Wisconsin, will represent the North Central Region; E. G. Applegate, Bendix Aviation Corp., Kansas City, Mo., will represent the Central Region; J. B. Parchman, Texas Instruments, Inc., Dallas, Texas, will represent the Southern Region; and T. H. Hardgrove, Aerojet-General Corp., Azusa, Calif., will represent the Western Region.

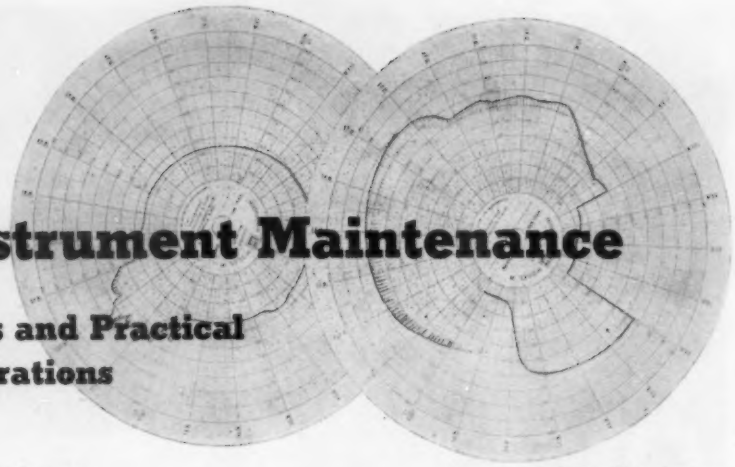
An All-Engineers' Luncheon was arranged by members of the Greater Philadelphia Plant Engineers' Club for the second day of the Seventh Annual Plant Maintenance and Engineering Conference.

The theme of the luncheon program was "Maintenance Management and Cost Control in the Armed Forces." This panel program was monitored by Oscar Graveley, Director of Maintenance in the Department of Defense, a member of the AIPE and on leave as plant engineer of Union Carbide and Carbon Co. of Niagara Falls, N. Y.

Brig. Gen. K. R. Barney, Chief of Installations, U. S. Army, discussed the maintenance procedure in the Army and the duties of the Post Engineer. Captain E. J. Peltier, Assistant Chief, Bureau of Yards & Docks, U. S. Navy, explained the Navy's maintenance program and what the Public Works Engineer does. Colonel J. E. Gill, Director of Facilities Support, ACS/I, USAF, described the maintenance policy followed by the Air Force and the duties of their Installation Engineer. Each of these men—the post engineer, public works engineer and the installation engineer—is the Armed Services' counterpart of industry's plant engineer.

Additional information about the AIPE organization can be obtained by writing to National Headquarters, Room 620, Westminster Building, Chicago 3, Illinois, or contacting any of the national or local officers. Membership directories are also available from National Headquarters.

Fig. 5. Approximately 300 people attended All-Engineers' Luncheon, January 24, at Convention Hall, Philadelphia



Industrial Instrument Maintenance

3-Instrument Systems and Practical Maintenance Considerations

By TOM M. GAYLE, Consulting Engineer

Charts: Dow Chemical Company

THE PREVIOUS SECTIONS of this article have dealt with (1) recent trends in instrumentation with their influence on maintenance and (2) the organization of an instrument department. This concluding section will cover practical maintenance considerations for some of the popular types of industrial instruments and controllers.

Any discussion of a plant's instruments may be broken down into a variety of convenient categories, but two basic classes, electric and pneumatic, will cover the vast majority of industrial instruments. Operating principles and maintenance considerations for the individual detectors of temperature, pressure, flow, level, force, speed, etc., are necessarily beyond the scope of this article and are mentioned only as they are usually associated with either electric or pneumatic systems.

Effects of Environment

Certain considerations apply equally well to practically all instruments whether they be electric or pneumatic, detector or controller, transmitter or receiver. One is the effect of the environment on the instrument mechanism. The effects of vapors, moisture and corrosive gases account for a sizable instrument mortality rate. Assuming that the instrument cannot be moved to a more favorable location, the choice is either to completely seal the instrument case or partially seal it and purge clean dry air into the case to exclude the corrosives.

The effects of abnormally high temperature in the vicinity of the instrument can be minimized by a shield if radiant heat is encountered or by purging if heat is due to ambient conditions. Continuous vibration and shock sometimes account for unexplained inaccuracy in an instrument, with pneumatic transmitters and galvanometer type electrical instruments especially vulnerable. Here, vibration damping or isolation is a practical solution.

A final factor to consider with most instruments is that of over-ranging—subjecting an instrument to quantities beyond its normal operating range. While some instruments may be over-ranged without harm, many classes of detecting devices will at least undergo a calibration shift. Although this is basically an operating problem, it nevertheless falls in the line of preventive maintenance for the instrument man.

Electrical Instruments—

Electrical instruments are used in plants for the measurement of the common electrical quantities (voltage, current, power), temperature, pH, and conductivity. Through suitable transducers such as strain gauges, load cells, and tachometers, they are used to measure many other variables.

The simplest and most fundamental electrical instruments are the familiar indicating panel meters employed for the measurement of voltage, current, and power.

Indicating millivoltmeters are frequently used for temperature measurement in conjunction with a thermocouple or thermopile. Basically, these meters differ from the standard moving coil microammeter only in scale calibration and the fact that they incorporate some simple form of cold junction compensator. Indicating pyrometers are essentially the same meter movement refined to a little greater degree. Alarm and control contacts available with these pyrometers are usually of the electronic vane or coil type, to prevent actual physical contact and interference with the indicating pointer.

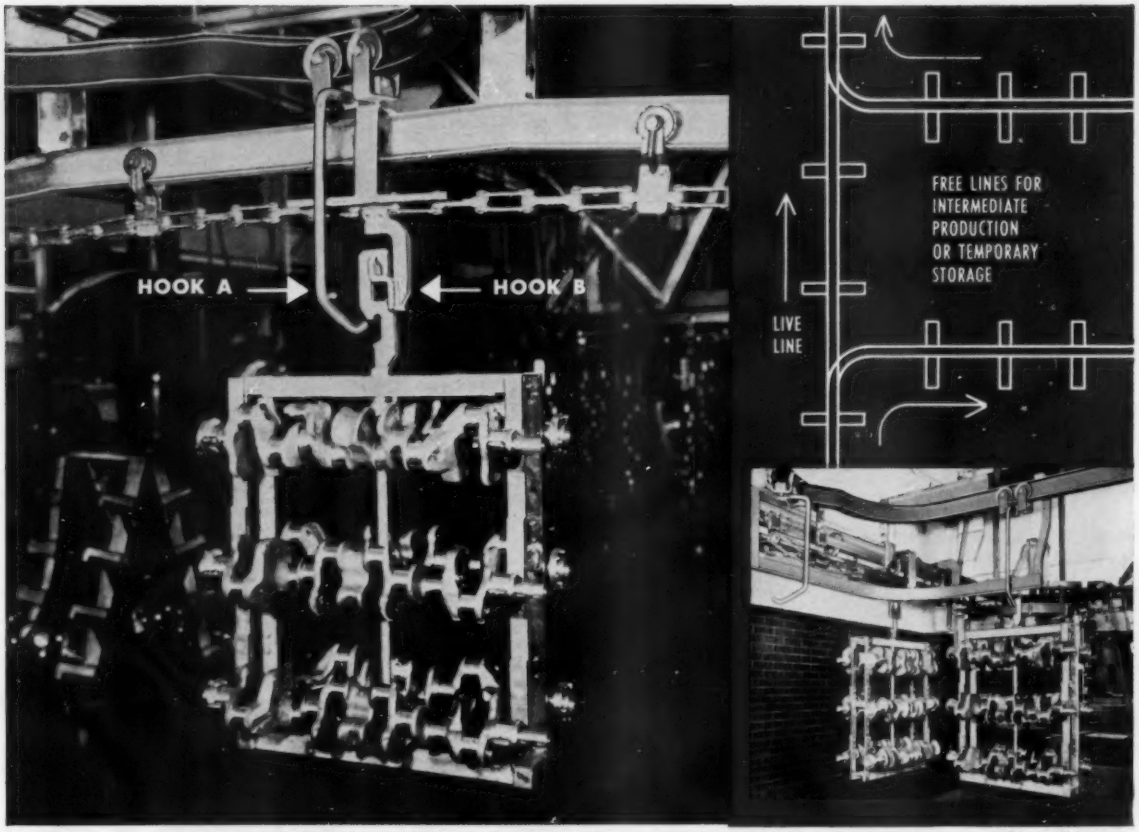
Recording instruments incorporating oversize meter movements have found limited industrial application. The indicating pointer is replaced by a small capillary pen which acts across a five or six inch moving strip chart. Small and light, this recorder is ideal for certain test applications requiring portable equipment to record voltage, machine load current or power factor at field locations.

Use Care in Installation

Both moving coil and vane type meter movements are relatively trouble-free (considering the fact that they are basically delicate instruments) unless they are subjected to physical abuse and corrosion or to considerable electrical over-range. Most difficulties result from misapplication or installation troubles. This type of instrument should not be mounted in a strong magnetic field or near a bus bar or cable carrying high current, and vibration should always be avoided unless the meter was specifically purchased for this type service. In a thermocouple type instrument, which is resistance sensitive, the thermocouple lead must be of proper gage.

Hanging up of a meter pointer is generally due to small bits of metal jammed in the movement, moisture in the meter, or cracked jewel bearings. A meter should never be removed from its housing except in a room or shop that is free from iron or steel filings or shavings, because the powerful magnet in the meter attracts small metal bits. Cracked jewel bearings can be avoided by reasonably careful handling. In this connection, if a meter type instrument is to be moved or transported, its leads should always be shorted together to prevent free movement of the pointer.

Undoubtedly, the most important



Unloading from the power line to the free line is accomplished simply and quickly when loading hook A engages with hook B automatically. Parts are engaged with the power line without danger of collision with incoming loads by simply reversing the disengaging principle.

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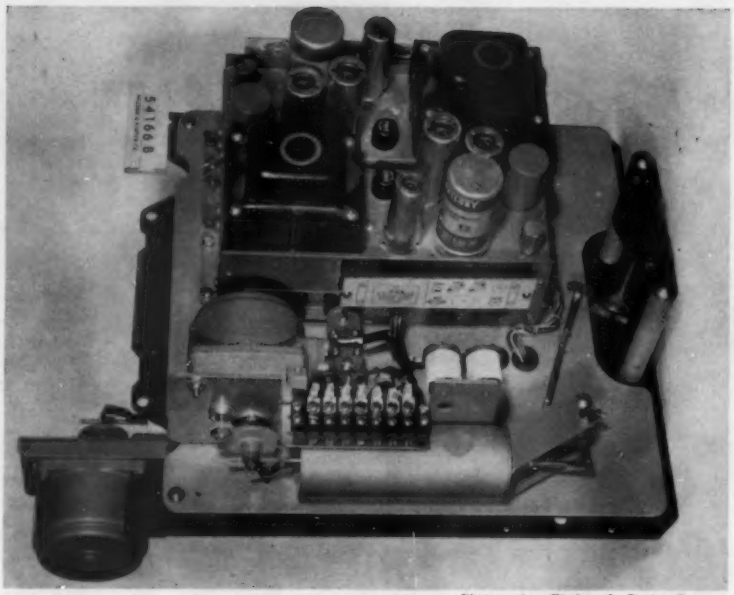
single class of industrial electrical instruments is the self balancing d-c potentiometer. These instruments are available as precision indicators, circular chart recorders, and strip chart recorders, both single and multi-point. Mechanical balancing and electronic null balancing types are in wide usage with the latter becoming more prevalent. In either type instrument, the unknown voltage generated by a thermocouple or other source is compared to an emf of known value. A precision linear slidewire is used to drop a battery voltage to compare to the input emf to be measured. The resulting unbalance is employed to drive a slidewire contact until a balance results. The recording pen and indicating pointer are directly linked to the slidewire contact.

In the mechanically balanced instrument, the unbalance voltage drives a galvanometer in one of two directions depending on whether the input emf is greater or less than the slidewire contact emf. A mechanical motor balancing system clamps the galvanometer every few seconds, "feels" its position, and drives the slidewire contact until a null or balanced condition results.

In the electronic balancing system, the unbalance voltage is fed to a network which converts the unbalance signal to alternating currrent and amplifies it to drive a servo motor which repositions the slidewire contact. In each of these systems, the battery voltage used for comparative purposes is automatically standardized at frequent intervals against a highly accurate reference cell.

These potentiometers represent electrical measurement in its highest practical form for plant use, with accuracies in the order of ¼ of 1 per cent of full scale. Although temperature measurement is their most frequent application, potentiometers are employed to record every conceivable variable that is electrical in nature. The use of the potentiometer was considerably accelerated when the multipoint instrument became available, permitting as many as 16 separate variables to be recorded with a single instrument.

Probably the most noteworthy maintenance considerations relative to potentiometers are of a mechanical nature. The key to trouble-free service lies in strict attention to cleanliness and lubrication. Desirable with all instruments, a clean atmosphere and tight case are absolutely essential to the life of a mechanical potentiometer or a multipoint electronic potentiometer. Rigorous attention to an oiling schedule as outlined by the manufacturer will insure that the mechanical complexity will not become a maintenance burden.



Photographs: Fischer & Porter Company

Fig. 1. Rear view of a typical dual channel electronic recorder. Unit illustrated above comprises two complete a-c amplifiers with individual servo motors

In addition to the amplifier contained in potentiometers, there are a great number of other electronic components finding wide plant application. Electronic circuits for detection and telemetering are becoming commonplace. Electronic controllers with full proportional, reset, and rate responses have been marketed in recent years.

While the designs and purposes of these electronic circuits are varied, there are certain common fundamental considerations that evolve. The components that seem to give trouble in electronic circuitry are contacts, vacuum tubes, gas tubes, electrolytic capacitors, paper capacitors, resistors and transformers in approximately that order of frequency.

Insofar as possible, an instrument department should stock a spare electronic amplifier or unit for each type instrument that is in any vital service. When trouble comes, a rapid change of units will permit a minimum of

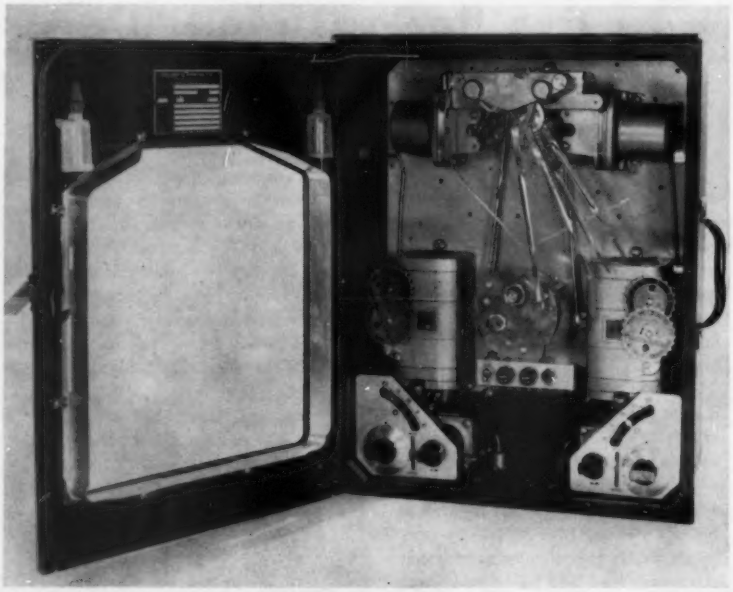
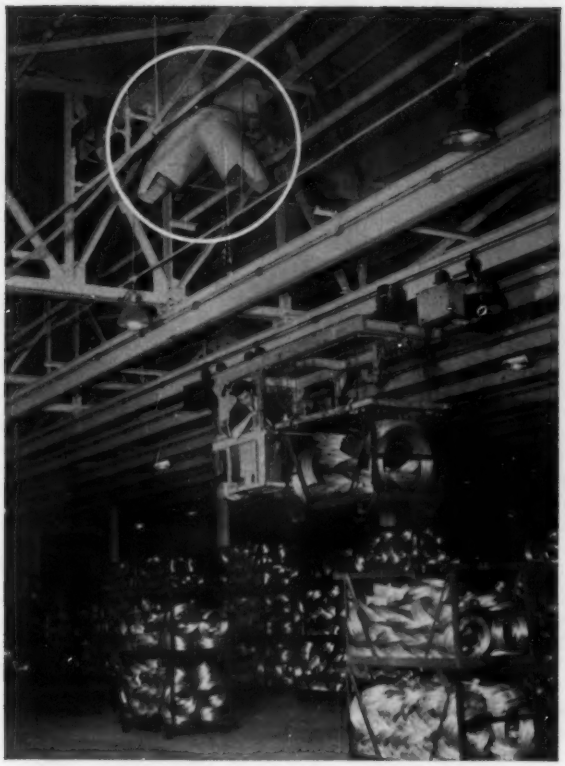
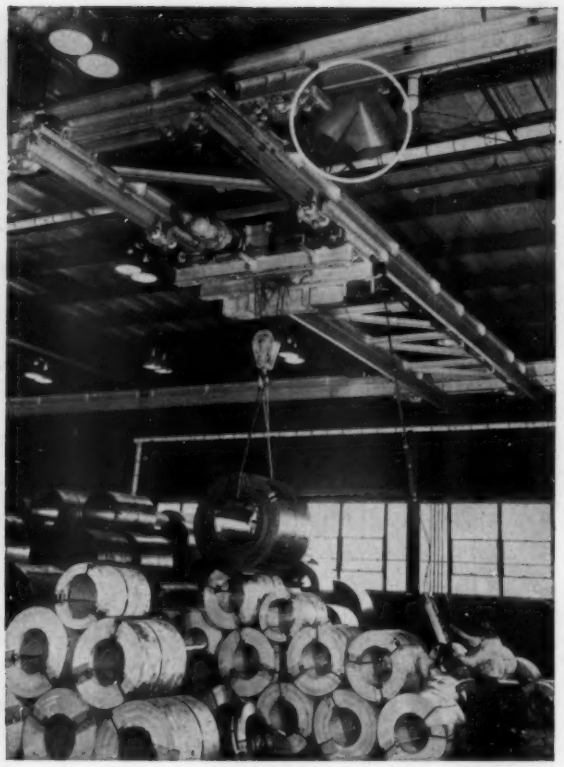


Fig. 2. Operating components of a two-pen pneumatic recorder. This particular unit features two separate controllers and two individual loading stations





Here's Proof of the Complete and Even Distribution of Heat by Wing Revolving Heaters

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operational interference. In recent years there has been a growing trend among manufacturers to "unitize" complex electronic circuits so that they may be easily repaired by the substitution of block components.

The equipment necessary for electrical and electronic instrument servicing is basically dependent on the number of instruments involved and the degree of repair undertaken. In any case, a vacuum tube voltohmeter is almost a "must" for the simplest of servicing. The usual voltohmeter used by electricians is usually unsatisfactory since it will load down most electronic circuits. A tube checker is a desirable piece of equipment if the number of electronic instruments is more than a dozen or so. Where tube replacement is less frequent, merely maintaining a stock of spare tubes and servicing by the substitution of a known good tube for a questionable one may suffice.

An oscilloscope is a valuable tool if servicing of electronic circuits is carried beyond the tube substitution stage. Phase shift, distortion, oscillation, and spurious signals are easily detected with a scope.

Pneumatic Instruments—

The flexibility of pneumatic instruments and their inherent explosion proof design have resulted in their wide acceptance. It is not uncommon to find 90 per cent of all instruments in a refinery or petrochemical plant to be of the pneumatic type. Nearly all the recently developed multi-element, ratio, and cascaded control systems employ pneumatic transmission due to the flexibility of handling and the ease of converting an air pressure signal into a proportional mechanical movement. The 3 to 15 psi air signals are readily combined in air relays to generate a desired function. With the introduction of polyethylene tubing, the cost of running a pneumatic signal line has dropped considerably below the cost of a cable required for a comparable electrical or electronic unit.

Pneumatic transmitters are most frequently associated with differential pressure devices for the measurement of fluid flow, liquid level, and specific gravity. They are also becoming popular in conjunction with pressure, force, and position detectors and with filled bulb temperature systems.

Pneumatic controllers have long been recognized for their accuracy, stability and dependability. In American industrial plants, the pneumatic type of controller is predominant, although electric analogs have found limited application in recent years.

The greatest single factor which affects the maintenance of pneumatic instruments is the air supply. The need for a dry, clean supply of well regulated air can hardly be overemphasized. Moisture in an air line has several detrimental effects, the most serious of which is the entry of condensate and foreign particles into the instrument mechanism. Condensate can cause rust and corrosion of fittings, thus producing scale that can plug a pneumatic pilot. If the air lines are exposed to low temperature, freezing of the condensate may occur and a shut down may result. In short, it pays to invest in clean air. The best solution is a separate instrument air supply, relatively small in capacity, which can easily be kept clean and contaminant-free.

In cleaning an air supply after compression, both condenser type and chemical type dryers should be used for optimum results. An aftercooler installed immediately following the compressor will condense the oil vapor and the majority of the water vapor present and subsequent hygroscopic chemical drying will take out the small remaining amount of moisture.

Aside from the effects of a poor air supply, pneumatic instruments require very little attention, the most likely trouble being a leak in an external air line.

In diagnosing trouble in a pneumatic system, it is wise to make a step by step check of each unit.

The only special apparatus required for servicing pneumatic systems will be some accurate pressure measuring equipment. A 50-in. water manometer and at least a 35-in. mercury manometer as well as a precision low pressure regulator are essential, and portable manometers are frequently helpful in diagnosing trouble in the field.

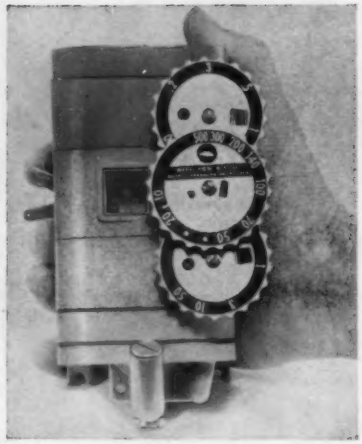

Fig. 3. Closeup of "stacked" pneumatic component used in the recorder

General—

In addition to the instruments specifically mentioned, there will be many others that require separate considerations and tools. The testing of filled bulb temperature systems will require a controlled temperature bath as well as some temperature standards. Pressure gages and records beyond the range of the previously mentioned manometers will require dead weight testers or precision test gages. Any scales or continuous weighing equipment will call for a set of standard weights.

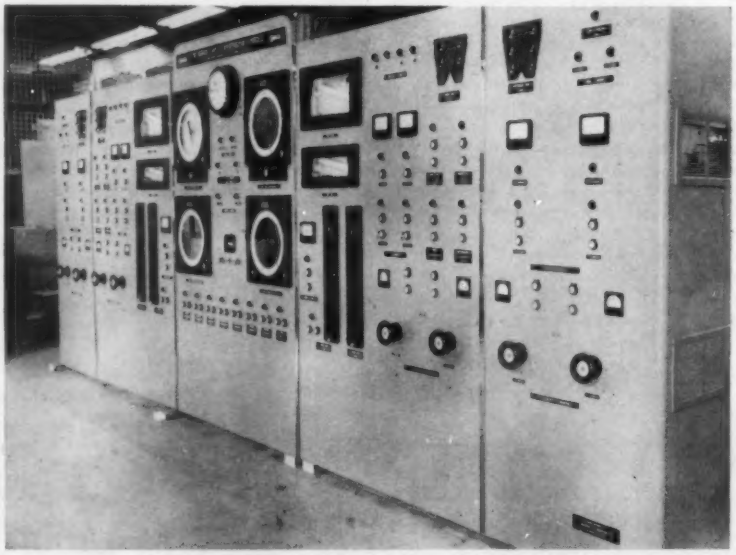

Fig. 4. Instruments are basic requirements for central control panels. To insure reliable process control, the instruments must be at the highest accuracy level

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Instrument Isolation—

Protect the Vibrated from the Vibrating

By L. S. Perlow, Engineer
The Korfund Company, Inc.

WITH TODAY'S TRENDS in modern industrial processes, where automation and complex electronic equipment hold the promise of increased efficiency, the importance of insuring accuracy of sensitive controls becomes a matter of extreme urgency.

Precision controls and instruments often perform erratically and inaccurately because of disturbances transmitted to the equipment from external sources. Typical sources of these external disturbances are neighboring production machinery, trains and industrial trucks. Rather than trying the sometimes obviously impossible: the isolation of an industrial truck, for example, some firms have found a more effective means of instrument protection. They isolate the instrument.

By mounting instruments like spectrometers, computers and optical comparators—or even entire instrument rooms—on vibration isolators, external disturbances can be prevented from interfering with precision.

One such piece of electronic equipment requiring protection from external vibration and shock is a paper mill speed regulator, Fig. 1, made by Westinghouse installed in the Gould Paper Co., Lyons Falls, N. Y. Its operational accuracy was being affected by the many sources of vibration and shock present in the paper mill: pumps, compressors, and the paper-making machinery itself.

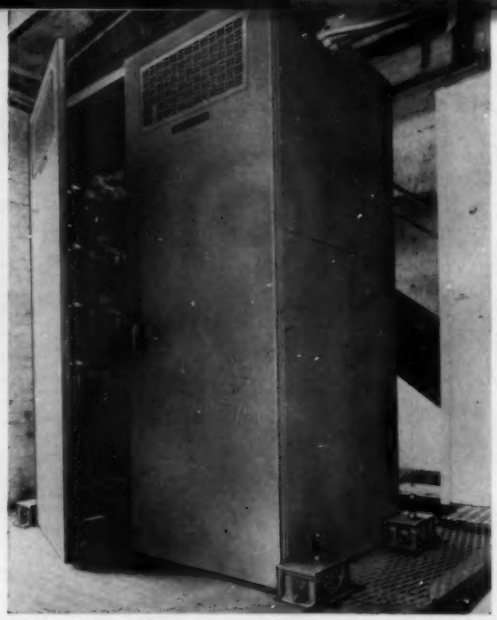


Fig. 1. Paper mill speed regulator at Gould Paper Co., isolated by means of both spring and pad type isolators

By resiliently mounting this large control cabinet on four isolators, all external tremor is now prevented from interfering with the accuracy of operation. To filter out any high frequency disturbances, pads of isolation material were used beneath the isolators. Structural steel saddles shown in the photo were used to maintain the original installation height.

Delicate balances, another piece of equipment found with increasing frequency in industrial plants, also need protection. An analytical balance in a laboratory of Southwest Potash Corp., Carlsbad, New Mexico, was such a unit. Vibration and shock transmitted from crushers and shakers in the processing plant had to be kept from interfering with the scale's accuracy. Engineers mounted the balance on a "floating" concrete block which is effectively isolated from the building structure.

Now, the highest degree of accuracy is maintained by completely isolating the work table from the concrete block (phantom lines in the photo show the block's shape) enabling the operator to work at the table without disturbing the balance. Leveling of the block —and thereby the balance—is easily made by means of adjusting bolts.

Use of electronic "brains"—the analog and digital computers—is finding ever-increasing application in all

(Continued on page 214)

Fig. 2. Sensitive analytical balance now operates with high accuracy at Southwest Potash Corp. despite vibration and tremor caused by crushers and shakers. Note how balance floats on spring-isolated concrete inertia mass (dotted lines)

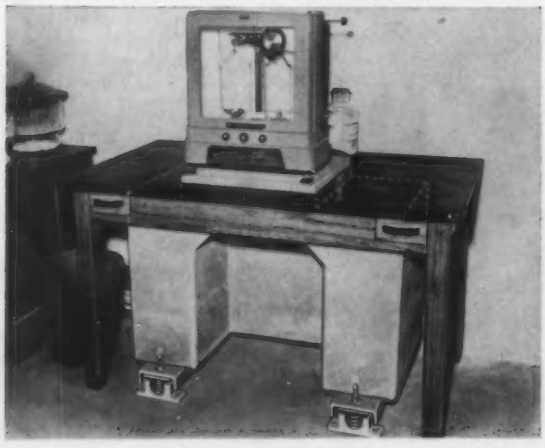
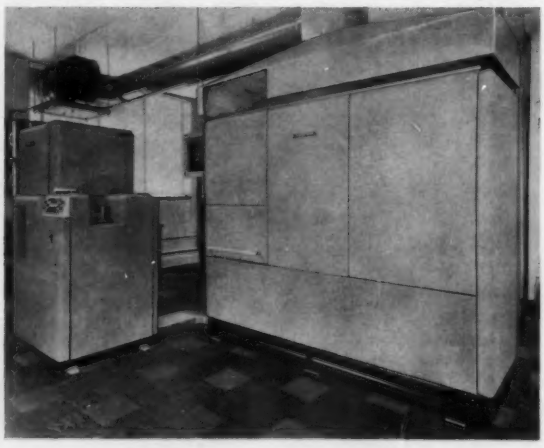
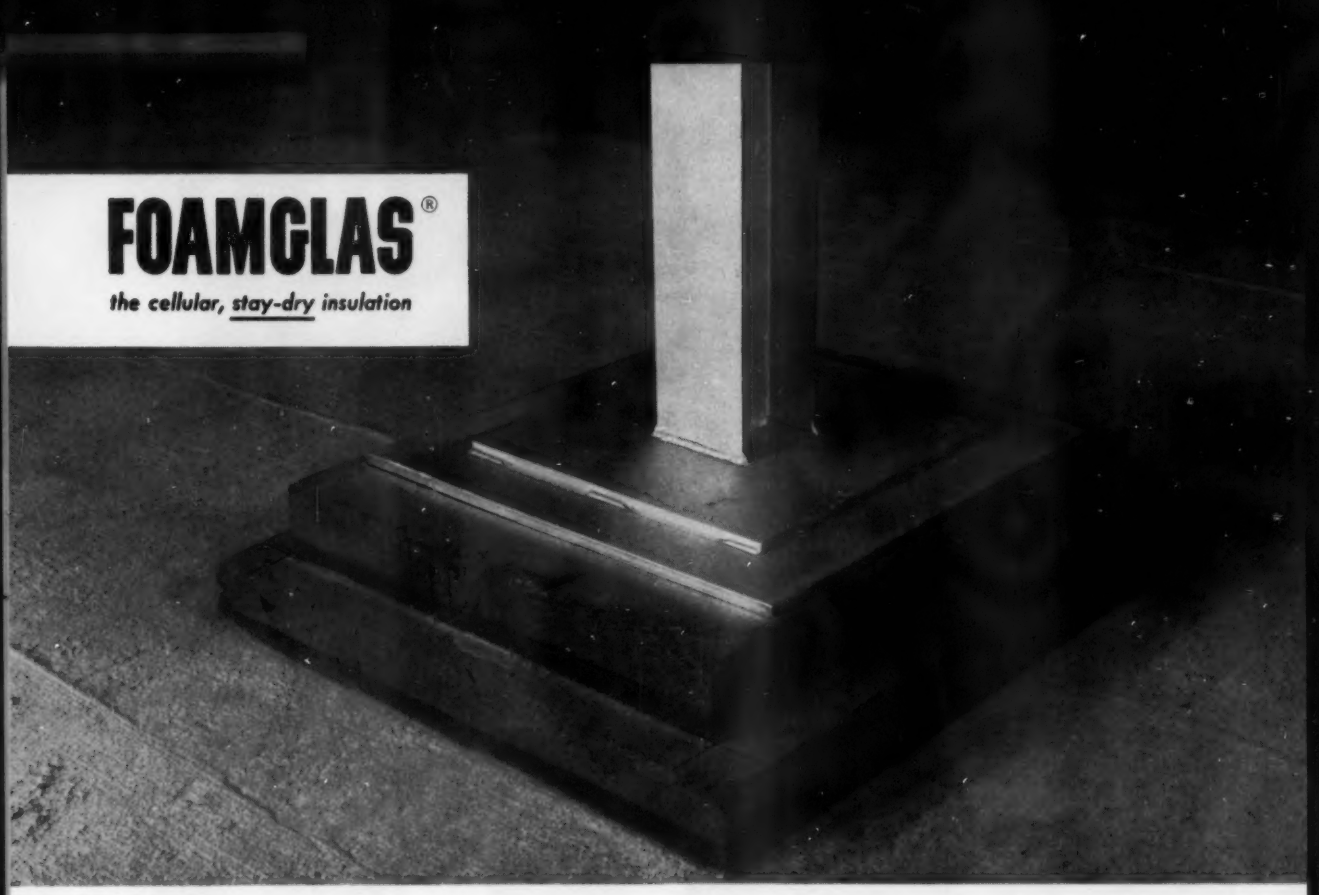


Fig. 3. Univac computer and card punch unit were transmitting disturbing vibration and noise to offices below the equipment. Spring isolators for the card punch unit and isolation pads for the Univac solved the entire problem





President Carl Steimle of Southern Michigan Cold Storage says...

"The weight of our new warehouse actually rests on FOAMGLAS floor insulation"

"FOAMGLAS floor insulation actually supports much of the weight of our new refrigerated warehouse." That's the report from Carl Steimle, president of Southern Michigan Cold Storage Company, Sodus, Michigan. They picked strong, stay-dry FOAMGLAS to insulate not only the floor, but also the roof, ceilings and all walls of the new building, first stage in a $1½ million building program.

This unique all glass insulation has a compressive strength of over 7 tons per square foot. Mr. Steimle says, "That made it possible to prevent thermal 'short circuits' by putting insulation *between* all load bearing columns and other structural members. All columns bear directly on FOAMGLAS without reducing its insulating performance."

FOAMGLAS can't absorb the moisture that cuts efficiency of other insulations. "The result," concludes Mr. Steimle, "is *constant*, precise control of temperatures (from —35 to +35F°), and we don't have the headache of recurring insulation replacement."

These benefits will be *yours* when you insulate your buildings, piping or equipment with FOAMGLAS. Prove it to yourself with six simple tests which you can perform in your own office. Write today for a free sample and complete testing directions.

Pittsburgh Corning Corporation

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Two layers of 4" FOAMGLAS insulate the entire floor area. There are no thermal "short circuits" since all load bearing columns rest directly on this remarkably strong insulation (see close-up, above).

For more facts circle 577 on Reply Card

Fig. 1. Grocery warehouse ideas were employed in this miscellaneous stock department with outstanding results

Fig. 2. In this bulk storage area the older stock is taken from back; new stock is put in front

Fig. 3. Use of equipment designed to operate in narrow aisles enable O'Brien to gain almost 50 per cent in usable floor space in this warehouse

Engineered Warehouse Pays O'Brien $51,000

By J. M. McCARTHY, Vice President, The O'Brien Corp.[1]

THERE'S A new material handling system in The O'Brien Corporation paint warehouse at South Bend, Indiana, that has made customers happy, employees happier, and management happiest.

Paint dealers need fast service on orders and re-orders—especially during rush season. To maintain turnover and to be sure no sales are lost by "out-of-stock" conditions, orders must be filled as quickly as possible. The old 96-hour schedule for filling orders was not always satisfactory.

Manual handling in the general warehouse had been a costly, back-breaking job for many years. Two men hauled loaded skids into the warehouse. A crew of six men manually pyramided the loads in the warehouse. The accident rate on this job was above plant average and there was a relatively high turnover of personnel.

Both of these problems were a concern to management. In addition, more warehousing space was needed to handle increased volume of business. All operations had been modernized—except warehousing and shipping.

Three basic material handling equipment recommendations were made by a consulting material handling engineer: double deck pallets, selective storage racks, and straddle type electric fork lift trucks.

Double deck pallets permit thirty-carton, pallet loading at the end of the packaging lines. Pallets are moved directly to the adjoining warehouse where they are stacked three high in single rows facing two aisles. High-demand volume items can be handled quickly and conveniently in bulk storage areas, and first-in first-out warehouse inventory control is a reality.

Selective storage racks were recommended to facilitate storage of mixed lot warehouse stock in the same floor space. Order filling is faster and more efficient and racks permit maximum use of floor space.

Straddle type electric fork lift trucks which can operate in 72 in. aisles increased the usable storage space in the new warehouse 30 per cent and increased the usable storage space in the old warehouse an equal amount.

The estimated warehouse space that would be needed to handle present product volume—without the new material handling system — would total 3,500 additional square feet. At $6.00 per square foot, present estimated cost of warehouse construction, the material handling system accounted for an estimated additional saving of $21,000.

Now all orders are filled within 36 to 48 hours after they are received.

[1] In cooperation with the Industrial Electric Truck Product Section of the Material Handling Institute, Inc.

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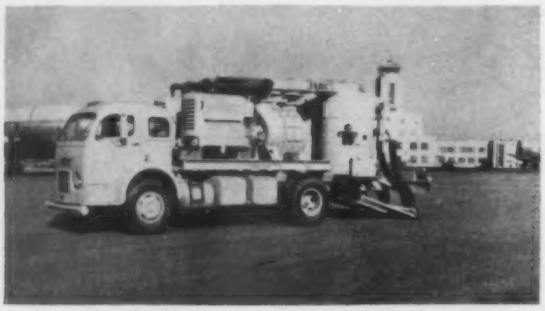
Industrial Exhausting Equipment Adapted for Use as Runway Cleaner

DUBBED THE "Jarc" by its manufacturer, the U.S. Hoffman Machinery Corp., a giant vacuum cleaner has been specifically designed for use on airfield runways handling jet aircraft operations. It is expected to make an appreciable reduction in engine damage and maintenance figures recorded as a result of foreign material being sucked in through jet plane airscoops.



Upon entering the airscoop, any object such as a bolt, nut, stone or piece of wood, immediately strikes the turbine blades, and normally, almost complete disintegration of the blades, as well as the rest of the engine, occurs in seconds.

Experience has shown that the only real guarantee against the entry of foreign objects is their removal from the runways, warm-up areas and hangar aprons.

The Jarc, weighing about 30,000 lb and measuring 30 ft in length, is able to clean and remove all debris from a two-million square foot area in about eight hours. The vacuum equipment, consisting of two heavy-duty industrial exhausters, is mounted on a specially-designed White Motors truck body.

Actual vacuum surface is made up of six ground-level nozzles, arranged over an 8-ft width at the rear of the vehicle. These nozzles suck in air at the rate of 350 mph.

Air Springs Carry Trains, Trucks and Busses, Can Float Newspaper Presses

AIR SPRINGS—pneumatic rubber and nylon bellows developed and made in Noblesville, Indiana, by Firestone Tire and Rubber Co., have their newest use on speedy, low-cost passenger trains. Budd, Pullman-Standard, ACF Industries, General Motors and General Steel Castings Corp. have introduced or plan railroad equipment on air springs.

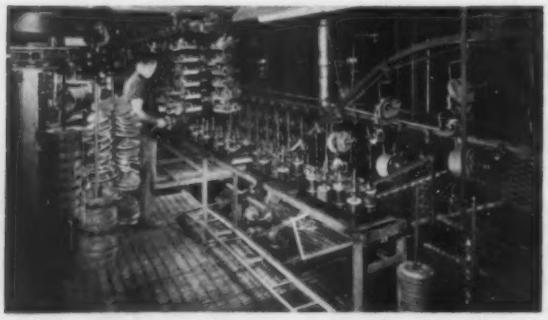
Trucks are also receiving consideration and tests with the air springs. When suspended on the bellows, truck bodies will stay at a constant height, making loading and unloading easier and will ride smoothly.

An air spring bellows looks like a small tire, and is made like one. Built around a drum from plies of nylon-impregnated fabric, it is vulcanized in a mold which gives it shape. One, two or three of the "tires" can be joined to form a completed air spring. Mounted on truck or train axles, the units are interconnected by a system of valves and air tanks.

Of interest to industrial plant engineers is the use of the air springs to float a newspaper press room floor preventing transmission of press vibration to other parts of the building.

Dispatching Station Provides Key to Overhead Conveyor System Operation

WITH NO EXPANSION in floor space, the Electric Motor Div. plant of the A. O. Smith Corp., Tipp City, Ohio, now has twice the productive capacity it had when it was built five years ago. Plant supervisory personnel give a large share of the credit to the flexible overhead conveyor system, was changed and extended as the plant grew.

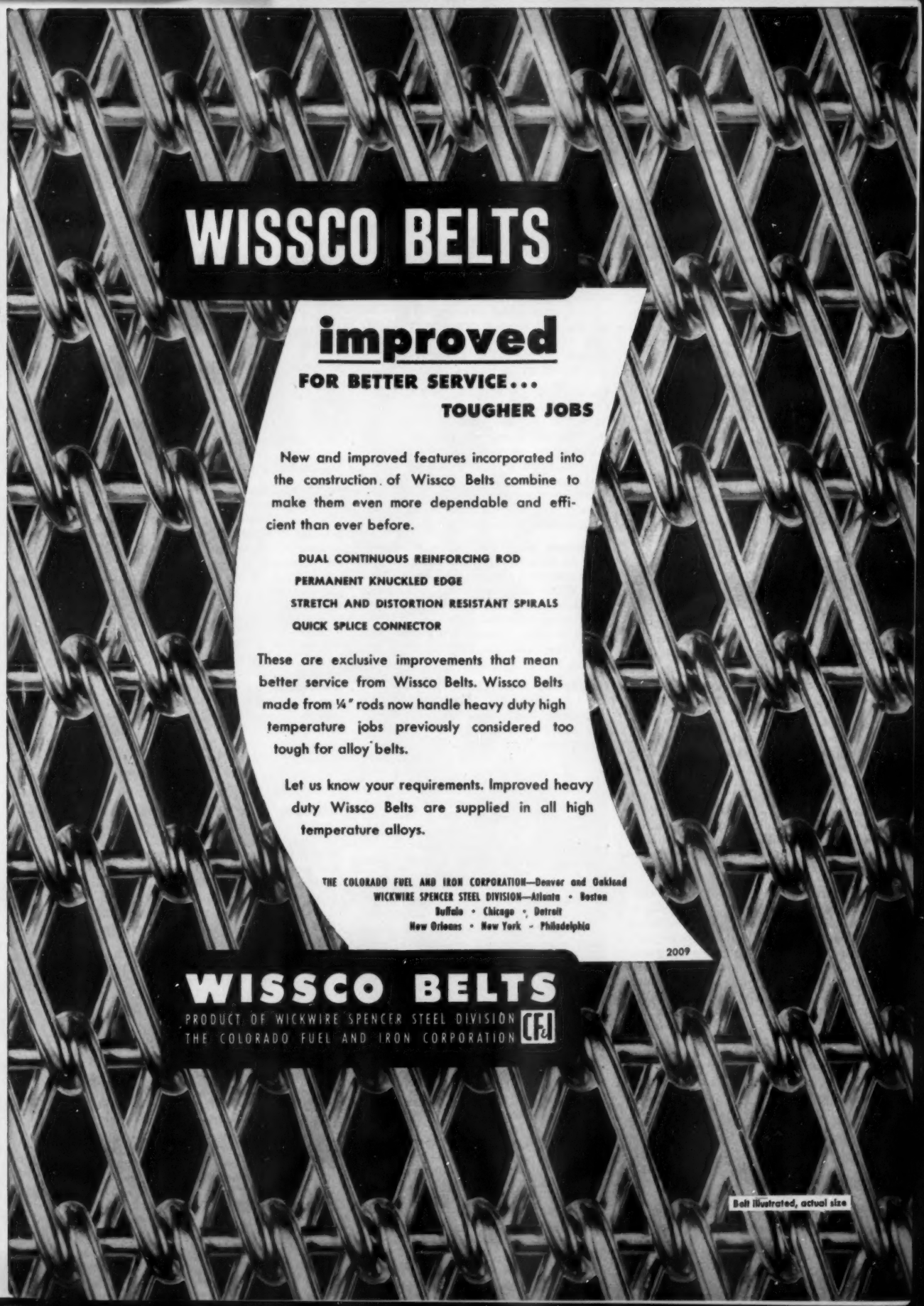


The 90,000-sq ft plant has an overhead conveyor system stretching almost 1¼ miles, employing only six handlers. Lightweight cable type conveyors, made by the Tipp Manufacturing Co., comprise approximately 85 per cent of the overhead installation. These conveyors are particularly suited for the comparatively light loads encountered in manufacturing small motors.

Whenever a part is removed from a conveyor to be worked on, it is always placed on another conveyor line or on a different hook on the same line, after the necessary work has been completed. The conveyors are continuously moving loops, circling or passing by areas where specific processing operations are carried on, and passing one another at points where transfers can be made.

Real key to the success of the installation is a unique dispatching arrangement, the nerve center of the whole system. A single dispatcher, stationed on a mezzanine at the converging point of conveyors from three production lines, hangs a matching set of motor components on a three-tiered hanger suspended from an overhead cable conveyor that moves past him to the final assembly line.

For more facts circle 579 on Reply Card ——→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NEW PLANT CONSTRUCTION — advance information on location, costs

Roberta, Ala.—American Marietta Co., 101 E. Ontario St., Chicago, Ill., has announced a new two year expansion program to increase company's output of lime, cement, and concrete pipe. Plan includes new cement plant to be completed early in 1957 and expansion of lime facilities. Expansion program to cost $15 million.

Sheffield, Ala.—The Reynolds Metals Co., Reynolds Metals Bldg., Richmond, Va., has announced a major expansion program for installation of sheet rolling facilities. New 100,000 ton primary aluminum reduction plant will be erected next to company's Alabama smelter. Project will include installation of a hot mill and cold rolling equipment. It is estimated that a total of $13 million will be spent.

Phoenix, Ariz.—Motorola, Inc., 4545 West Augusta Blvd., Chicago, Ill., producers of television and radio receivers, has authorized plans for a $3 million plant addition to its military electronics engineering, research and production facilities.

Antioch, Calif.—Fibreboard Products, Inc., 1789 Montgomery Street, San Francisco, Calif., has authorized plans for company expansion for increase of corrugated case capacity at local plant. Plant will have 260,000 sq ft of floor space and is scheduled to be completed late this year. It will represent an investment, including equipment, of about $3 million.

Oakland, Calif.—Kaiser Aluminum & Chemical Corp., (Chemical Division) has announced a major expansion program to increase capacity for the production of refractory and magnesia products. New facilities will be added at the Moss Landing, Calif., seawater magnesium plant and the Columbiana, O., basic refractories plant, now under construction. Cost: $3 million.

San Jose, Calif. — The International Business Machines Corp., 590 Madison Ave., New York, N. Y., has acquired a 190 acre tract of land as new plant site to include a manufacturing plant, of 400,000 sq ft, two product engineering buildings, school, cafeteria and a group of laboratory buildings. Construction will begin soon for fall occupancy. Project to cost $8 million.

Plainfield, Conn.—American Radiator & Standard Sanitary Corp., Sanitary Building, Pittsburgh, Pa., has plans under way for the erection of a new 560,000 sq ft one-story building for the manufacture of vitreous china plumbing fixtures. Cost reported in excess of $8 million.

Louisville, Ky.—Globe-Union, Inc., 900 East Keefe Ave., Milwaukee, Wis., has approved plans for the construction of a 90,000 sq ft storage battery manufacturing plant. Construction is scheduled to begin at once with completion in late 1956. Cost reported in excess of $1 million.

Gramercy, La.—Kaiser Aluminum & Chemical Corp., 1924 Broadway, Oakland, Calif., has authorized plans for erection of a new caustic-chlorine plant adjacent to company's new aluminum project now under construction. New facility will have a capacity of 40,000 tons of caustic soda and 36,000 tons of chlorine annually. Plant represents investment of $8 million.

Carteret, N. J.—Hudson Pulp & Paper Corp., 477 Madison Avenue, New York, N. Y., has approved plans for the erection of one story plant for the manufacture of paper cups and containers. Plant will be a pilot operation with expansion planned at a later date. Total investment of land, building, machinery and equipment is expected to approximate $2 million.

Paulsboro, N. J.—Socony Vacuum Oil Co., 26 Broadway, New York, N. Y., has authorized plans for the installation of a 22,000 bbl-a-day refining unit for improving the quality of heating oil and other distillate fuels. Foster-Wheeler Corp., New York, N. Y., will build the unit to be completed in March 1957.

Clarington, Ohio—The Olin Mathieson Chemical Corp., Mathieson Building, Baltimore 3, Md., has plans under way for the construction of new integrated aluminum plant at Omal, Ohio, on the Ohio River near Clarington. The new facility will include alumina and reduction plants and a rolling mill. Mathieson's initial investment will total about $120 million; $90 million will be expended for the aluminum plant; and $30 million for joint operation of necessary power facilities with Pittsburgh Consolidation Coal Corp.

Cleveland, Ohio—True Temper Corp., 1623 Euclid Avenue, has authorized plans for the erection of new plant for the manufacture of garden, lawn and farm tools on company site near Ashtabula, O. Work will get under way at once and is scheduled to be ready for partial occupancy late this fall. New unit will consolidate and replace facilities now in operation at both Ashtabula and Geneva, Ohio. Cost reported to be $3.5 million.

Miami, Okla.—The B. F. Goodrich Co., 500 S. Main Street, Akron, Ohio, has instituted an expansion program in local plant to increase off-the-road tire production. Construction is to begin at once at a reported cost of $4 million. New facilities will include buildings, utilities and equipment.

Bethlehem, Pa.—The Bethlehem Steel Corp. has recently announced that it plans to spend $300 million on an expansion program through 1956 and 1957. Three million tons of ingot capacity will be added to company production by the end of 1957. Two million tons will be added to plant capacity at Sparrows Point, Md. Additional capacity is also planned at Bethlehem, Pa., and Lackawanna, N. Y., plants. This year's expenditure will exceed $160 million exclusive of the $100 million for ore project of Erie Mining Co.

Midland, Pa.—Crucible Steel Co. of America, Oliver Building, Pittsburgh, Pa., has announced plans for expansion of Midland works with installation of new mill for cold-rolling of stainless steel and titanium strip. Installation is scheduled for completion in 1957 at a reported cost of $2.5 million.

La Quinta, Texas—The Reynolds Metals Co., Reynolds Metals Bldg., Richmond, Va., has announced a major expansion program to increase capacity of alumina plant here. Production will be increased to more than 1,500 tons of alumina or semi-processed bauxite per day over present capacity of 1,000 tons daily. Cost of expansion estimated at between $25 and $30 million.

Big Spring, Texas—Cosden Petroleum Corp. has authorized plans for the construction of new facility for the manufacture of styrene at local refinery. Construction will begin at once and is reported to be a $3 million investment. Plant is expected to be in operation early in 1957. Badger Manufacturing Corp., Cambridge, Mass., have been awarded construction contract.

Hoquiam, Wash. — Rayonier, Inc., Chemical Cellulose manufacturers, 161 E. 42nd St., New York, N. Y., has approved plans for the construction of a new wood chipper plant adjoining company's pulp plant. Plant will chip logs up to 30 in. in diameter for the pulp mill. Completion is scheduled for the late spring of 1957, at an estimated cost of $3.3 million.

Kent, Wash.—The Borden Co., Chemical Division, 350 Madison Ave., New York 17, N. Y., plans to construct a new plant for the production of 36,000,000 lb of formaldehyde a year. Cost of new installation reported to be in excess of $1 million.

Washington, W. Va.—The Borg-Warner Corp., 310 S. Michigan Ave., Chicago, Ill., has authorized plans for the construction of new plant as major expansion move in its plastics manufacturing activities. New plant will consist of a series of individual buildings. Plant is scheduled for completion by January 1957 at a cost in excess of $10 million.

Motor Burnouts *are preventable!*

Eliminate causes and avoid failure

Extensive surveys reveal the astonishing fact that a large percentage of motor burnouts occur from *avoidable* causes such as overload, clogged passages or confined spaces, improper circuit protection and bearing failure. These conditions, if not corrected, result in overheating of the windings. Ordinary insulations are organic and will carbonize when excessively heated, resulting in motor burnout.

As a means of increasing motor life and to resist burnouts the windings in U.S. motors are insulated with inorganic *asbestos*, greatest of heat-resisting elements and Nature's only incombustible fiber.

Asbestos is used in sheet form to separate the windings and in a compounded form, vibro-applied, as a filler to completely isolate each wire. Coil ends are further protected with a built up armor of several coatings of an asbestic compound that smooths the surface and forms an impervious protection against moisture.

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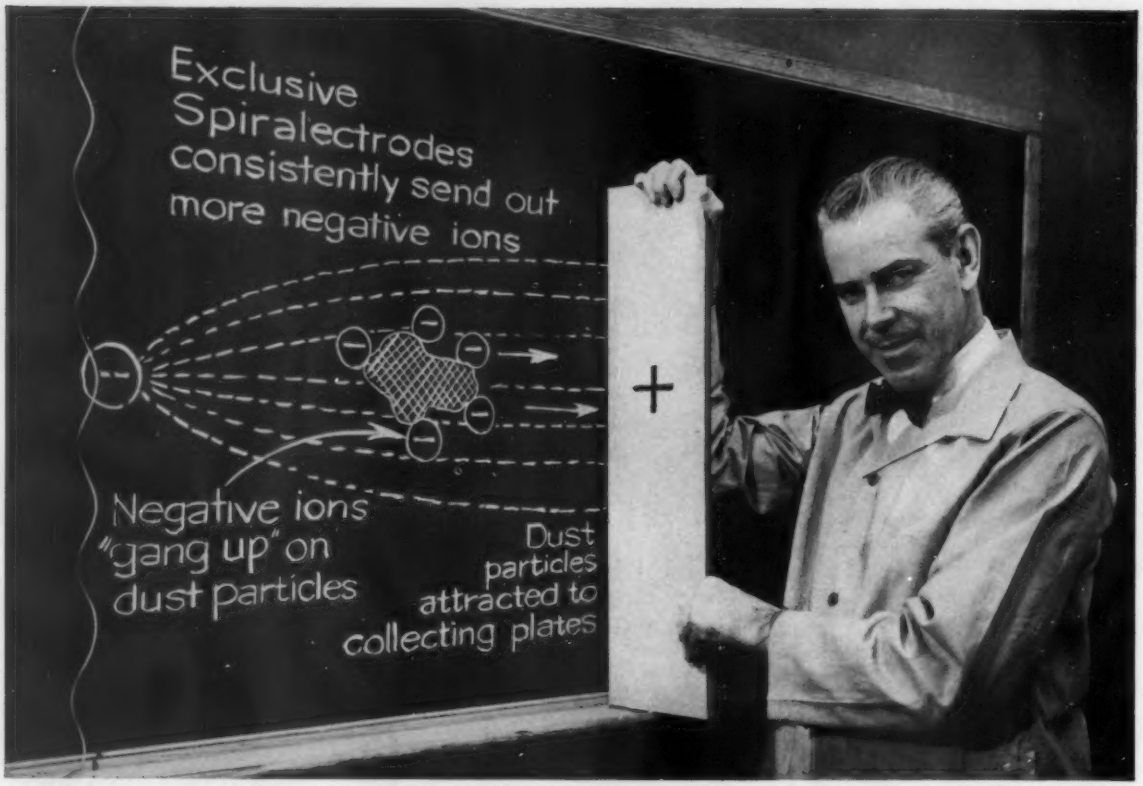
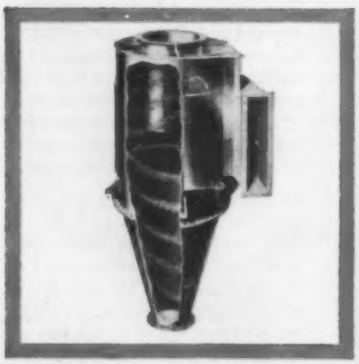
How a Buell Collection System "gangs-up" on dust to meet the toughest air pollution codes





Buell Cyclones also deliver extra collection efficiency to "gang-up" on dust: Exclusive Shave-off design harnesses double-eddy current and puts it to work.

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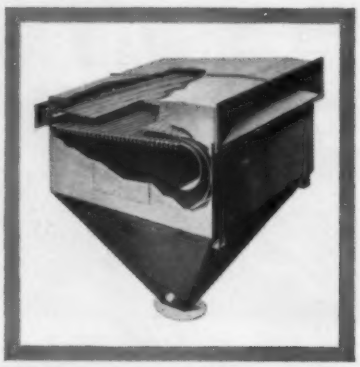

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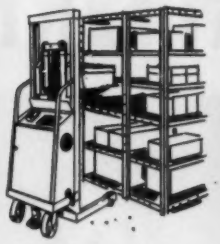
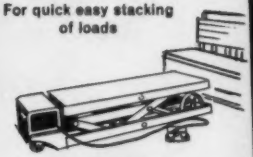
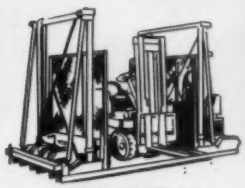


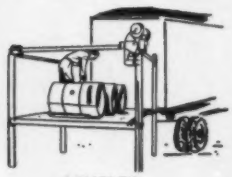
LIGHT DUTY LIFTER
For quick easy stacking of loads



"ELECTRAULIC" LIFT TABLE
For leveling sheet steel or dies at shears or press.



"FOUR POSTER"
Electraulic lifter for heavy loads



LEVELER
Economical Model for raising 6000 lb. loads up to 5 ft.

in handling materials... **USE AUTOMATION'S BEST!**

use COLSON CONVEYORS and SYSTEMS..

today's best designed

Get modern speed and economy . . . keep your plant in a competitive position. Let Colson—the experts in every materials moving problem—send you a specialist to help analyze your plant layout, design your floor space for best use, and aid you in choosing and applying the right equipment for your particular job.

A. POWERED BELT CONVEYORS. Steel bed inter-floor belt conveyor for permanent installation. Medium and heavy load types.

B. LOW COST PORTABLE Aluminum and Steel Conveyors, Many models. For boosting, stacking, loading and unloading. One man can move and adjust over a stairway.

C. ALUMINUM or STEEL WHEEL CONVEYORS. 10' and 5' sections. 45-and 90-deg. curves. No-sag, non-loosening wheels. Steel Wheels: 850 lb. capacity; Aluminum Wheels: 325 lb. capacity—per 10' section.

D. STEEL ROLLER CONVEYORS, Light, Medium, Heavy Duty. Ball bearing rolls. 10' and 5' sections. 45- and 90-deg. curves. Light Duty: 850 lb. capacity; Medium Duty: 1200 lb. capacity; Heavy Duty: 1500 lb. capacity—per 10' section.

EASY VERTICAL LIFTING

Colson®

SMOOTH HORIZONTAL ROLLING

VISIT OUR BOOTH NO. 1021 AT THE MATERIAL HANDLING INSTITUTE EXHIBITION JUNE 5th TO 8th IN CLEVELAND, OHIO

No. 6-807-195

No. 4-1037

No. 6-808-17

CASTERS

COLSON HANDLER
Lifts, transports 2-ton loads on low capacity floors.

LIFT JACK TRUCK
No. 6712

DRUM HANDLING TRUCK
No. 6055

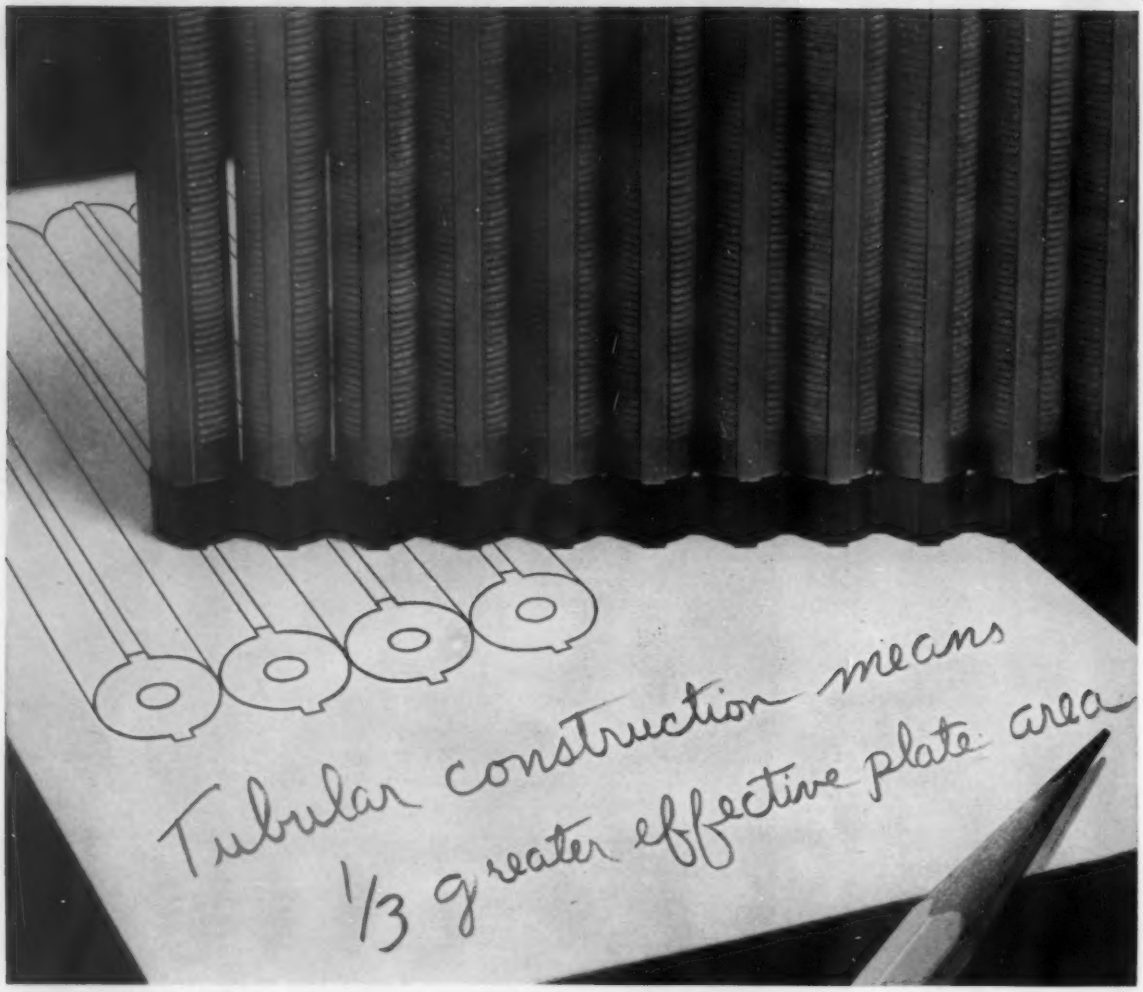
IN LINE TRUCK
No. 7010

Write or phone for recommendation by specialists

The Colson Corporation · General Offices, **Elyria, Ohio**
Factories in Elyria, Boston, Toronto

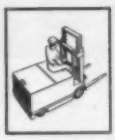
For more facts circle 582 on Reply Card

EXIDE-IRONCLAD BATTERIES



Greater effective plate area boosts power for peak loads

BATTERY FOR POWERED HAND TRUCK, Model TH. Fits snugly into space provided on truck. Has tubular construction of positive plates, Silvium grids, "Permanized" negative plates, extra heavy connectors and all other Exide-Ironclad advantages that mean power to spare in heavy duty applications. Write for Bulletin 5161.



According to general principles of storage battery engineering, power reserve is governed by positive plate area. In the Exide-Ironclad greater effective plate area is achieved without increasing plate size. Here's how:

In the Exide-Ironclad positive plate, active material is held captive in tubes of slotted polyethylene. These tubes are arranged in a tight row with electrical connections only at the top. The actual surface of the plate is the combined semicircular sides of these tubes—the total surface area being roughly one-third more than the projected dimensions of the plate.

In use, this unique design feature means that more active material is exposed to electrolyte for a given size battery. It means the battery can provide power to spare for peak loads as well as a dependable source of continuous power.

Only Exide-Ironclad Batteries have this advantage. Be sure to specify them when you order—for either new equipment or for replacement. Exide Industrial Division, The Electric Storage Battery Company, Phila. 2, Pa.

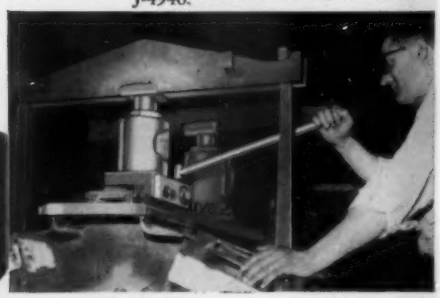
Exide®

For more facts circle 583 on Reply Card

Every BLACKHAWK Hydraulic Jack

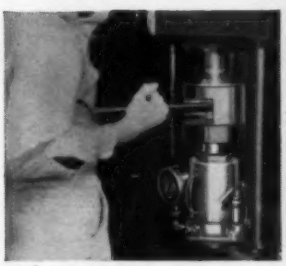
does more than lift!

Of course they lift — fast and sure! But that's only part of the story of how Blackhawk jacks *put hydraulic muscles to work for you!* Throughout industry and construction — for production, maintenance, and in the lab — Blackhawk jacks (1½ through 100 tons) speed up jobs, cut costs, make men more productive. Depend on your supply house for the *whole line* of Blackhawk hydraulic tools — which includes standard jacks and "Porto-Power" remote control jacks with attachments for a wide variety of applications. For catalog H-201 (it's full of ideas), write today to Blackhawk Mfg. Co., Dept. J-4946, Milwaukee 46, Wisconsin.



It's a low-cost production tool

The toughest problems are made easy — at lower cost — with Blackhawk hydraulic tools. Here six 50-ton Blackhawk jacks hold two diesel engine crankshaft sections together for welding.



It measures . . .

Gauge-equipped Blackhawk hydraulic jacks test stress, load and pressure in industry and on construction jobs. Photo shows materials-testing with gauge-equipped Blackhawk.

It pushes . . .

Blackhawk hydraulic jacks deliver full power at any angle. Here eight Blackhawk jacks skid a four-span bridge 14 feet in 12 hours. *Mechanical* jack record was 13 *inches* in a *day*.

It powers a press . . .

The fast, smooth, dependable force of Blackhawk jacks makes them the choice of press manufacturers. Photo shows Blackhawk jack taking the high costs and trouble out of production.

It straightens . . .

Precise control adapts Blackhawk jacks to important roles in fabrication operations. Here, one man with five Blackhawk Hand Jacks is straightening a welded structure.

See Sweets Plant Engineering Catalog File 1L/BL

"Porto-Power" Remote control Jacks | Hydraulic pipe-benders and knockout punches | Power driven hydraulic pumps | Gauge-equipped jacks | Hydraulic jacks thru 100 tons

BLACKHAWK®

The world's largest manufacturer of hydraulic tools

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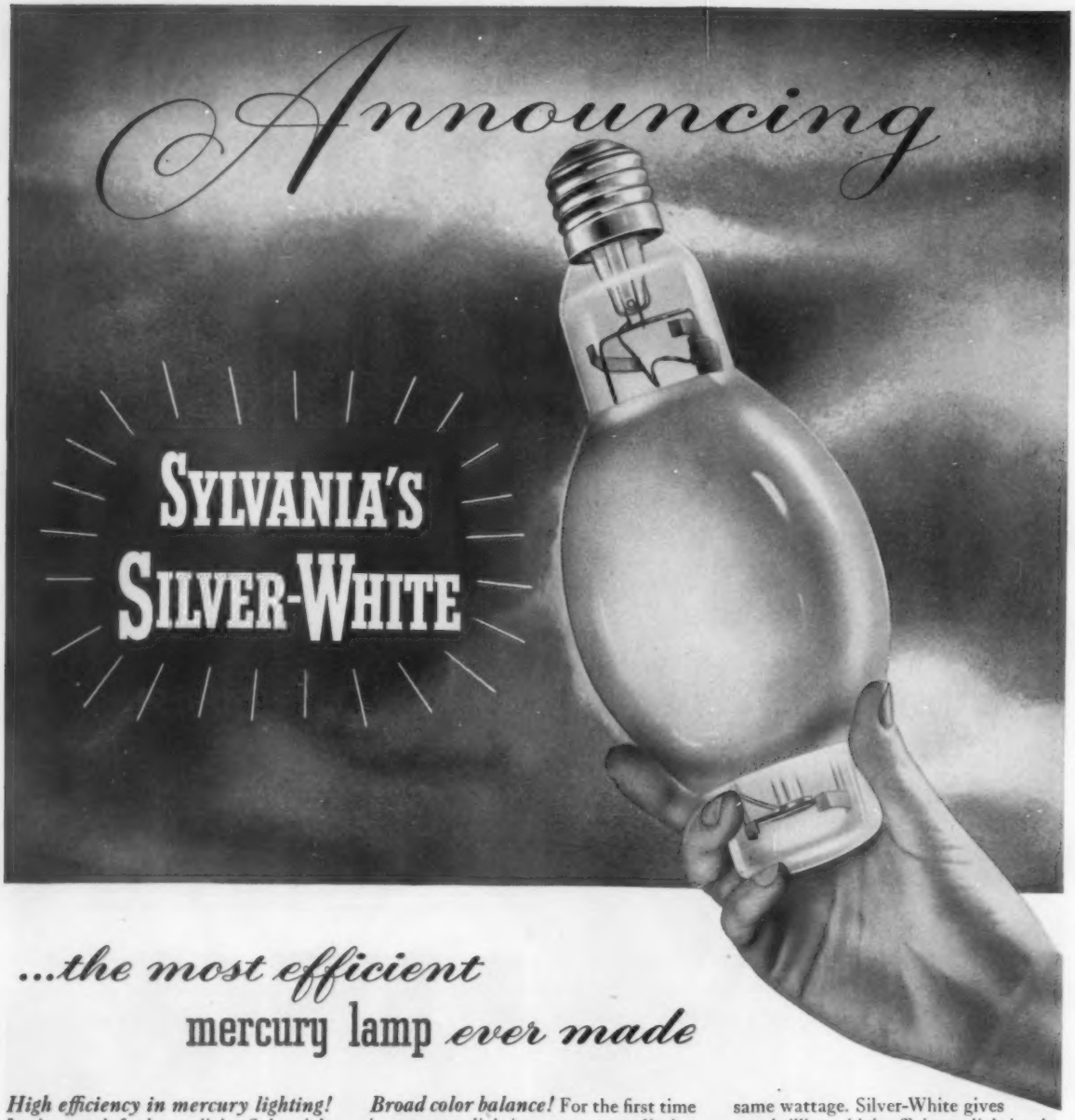


...the most efficient mercury lamp ever made

High efficiency in mercury lighting! In the search for better light, Sylvania's scientists have developed new phosphors that enable the Silver-White mercury lamp to produce 10 to 20 per cent *more* light than clear mercury lamps.

The new phosphor in this bulb actually *adds* light, where previous "color improvements" subtracted from the light of the ordinary clear mercury lamp. The silver-white coating on this bulb diffuses and softens the tremendous light output. No other type of mercury lamp gives you so much light for your lighting dollar.

Broad color balance! For the first time in mercury lighting you get radiation across the whole width of the color spectrum.

Lighting costs are reduced! The 400-watt Silver-White mercury lamp gives on the average 7 times the burning hours of life as compared with incandescent of the same wattage.

Sylvania's Silver-White mercury lamps are now available in ratings of: 100-watt, 175-watt and two 400-watt types. They cost no more than other color-corrected mercury lamps of the same wattage. Silver-White gives you brilliant, high efficiency lighting in the factory, service station, parking lot, and in street and highway lighting.

A Sylvania lighting engineer would like to tell you how you can get more and better light for less money in your particular lighting installation. For technical and application data, write directly to:

SYLVANIA ELECTRIC PRODUCTS INC.
Lighting Division, Salem, Mass.

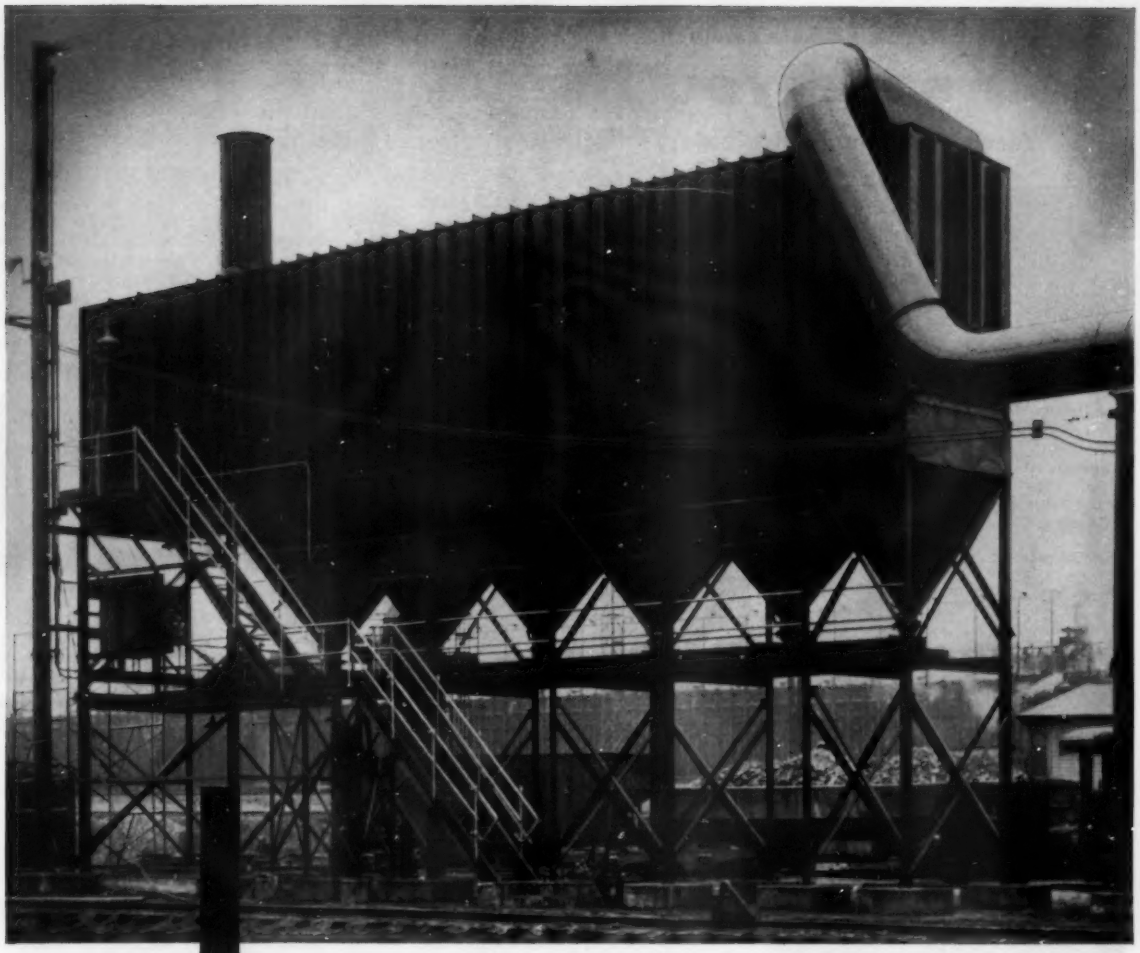
In Canada: Sylvania Electric (Canada) Ltd., University Tower Building, St. Catherine Street, Montreal, P. Q.

SYLVANIA®

... fastest growing name in sight

LIGHTING • RADIO • ELECTRONICS • TELEVISION • ATOMIC ENERGY

For more facts circle 585 on Reply Card



This Dracco Multi-Bag Filter at Jones & Laughlin Steel Corporation's Aliquippa (Pa.) Works is a complete unit with integral classifier and fan house. As a giant "safety device", its job is to . . .

"get the lead out!"

Jones & Laughlin Steel Corporation uses a Dracco Multi-Bag dust filter to keep its plant area free from toxic lead fumes which could endanger the health of workmen. These fumes are created at the pouring platform in the manufacture of leaded steel.

Lead, when added as pellets to molten steel, forms a suspension which acts as an internal lubricant to improve the machining quality of the steel. As the pellets are added during the pouring process, some of the lead volatizes.

To prevent escaping lead from polluting the plant atmosphere, dust intake hoods at the source trap 36,000 cubic feet of fume-laden air per minute. High efficiency of the Dracco Multi-Bag Filter assures 99½-100% fume recovery. Heavy-gauge steel construction of the filter unit makes it last longer with less upkeep.

Perhaps your plant has a dust problem causing product waste, abrasive wear to machinery or unhealthy working conditions. If so, it will pay to find out how Dracco methods can correct the situation and improve your plant efficiency. Write or call today!

DRACCO CORPORATION
4035 East 116th Street • Cleveland 5, Ohio

FREE! THE DRACCO ENGINEER. Describes Dracco solutions to many bulk materials handling and dust control problems—includes tips on improving plant efficiency . . . published quarterly. Get on the mailing list. Write on your letterhead today!

DRACCO *Performance Proved*
Airstream **CONVEYORS · DUST CONTROL EQUIPMENT**

For more facts circle 586 on Reply Card

Some name on this page can save you money!

Alcoa® Aluminum Distributors Offer Many Services to Help You Cut Costs

Deliveries geared to your production...

ALABAMA	
Birmingham	†Hinkle Supply Company
ARIZONA	
Phoenix	Ducommun Metals & Supply Co.
CALIFORNIA	
Berkeley	Ducommun Metals & Supply Co.
Los Angeles	†Ducommun Metals & Supply Co. Pacific Metals Co., Ltd.
San Diego	Ducommun Metals & Supply Co.
San Francisco	†Pacific Metals Co., Ltd.
COLORADO	
Denver	M. L. Foss, Inc. Marsh Steel Corporation Metal Goods Corporation
CONNECTICUT	
Milford	†Edgcomb Steel of New England, Inc.

Technical aid on any problem

FLORIDA	
Jacksonville	Florida Metals, Inc.
Miami	Florida Metals, Inc.
Tampa	†Florida Metals, Inc.
GEORGIA	
Atlanta	†J. M. Tull Metal & Supply Co., Inc.
IDAHO	
Boise	Pacific Metal Co.
ILLINOIS	
Chicago	†Central Steel & Wire Co. Corey Steel Co. †Steel Sales Corporation
INDIANA	
Indianapolis	Steel Sales Co. of Indiana, Inc.
KANSAS	
Wichita	Marsh Steel Corporation Metal Goods Corporation
KENTUCKY	
Louisville	Williams & Co., Inc.
LOUISIANA	
New Orleans	Metal Goods Corporation
MARYLAND	
Baltimore	Whitehead Metal Products Co., Inc.
MASSACHUSETTS	
Cambridge	Austin-Hastings Co. Whitehead Metal Products Co., Inc.
Roxbury	Eastern Metal Mill Products Co.
MICHIGAN	
Detroit	Central Steel & Wire Co. Steel Sales Company of Michigan
MINNESOTA	
Minneapolis	Steel Sales Co. of Minn.
MISSOURI	
Kansas City, North	†Marsh Steel Corporation Metal Goods Corporation
St. Louis	†Metal Goods Corporation
NEW HAMPSHIRE	
Nashua	Edgcomb Steel of New England, Inc.
NEW JERSEY	
Harrison	Whitehead Metal Products Co., Inc.
Hillside	Miller Steel Company
Kenilworth	Kenilworth Steel Co.

Complete line of warehouse stocks

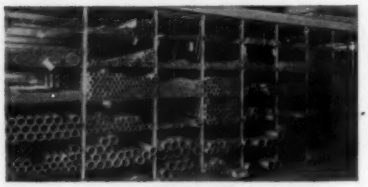
NEW YORK	
Albany	†Eastern Metals Warehouse, Inc.
Buffalo	Brace-Mueller-Huntley, Inc. Whitehead Metal Products Co., Inc.
New York (Long Island City)	Adam Metal Supply Co., Inc.
New York	Eastern Brass & Copper Company Henry B. Lust (Circles) Manhattan Brass & Copper Company Straus Aluminum Co., Inc. †Whitehead Metal Products Co., Inc.
Rochester	Brace-Mueller-Huntley, Inc. Metal Supply, Inc. Sachs Metal Supply Co.
Syracuse	†Brace-Mueller-Huntley, Inc. Whitehead Metal Products Co., Inc.
NORTH CAROLINA	
Charlotte	Edgcomb Steel Co.

Material cut to specified sizes

OHIO	
Cincinnati	Central Steel & Wire Co. Williams & Co., Inc.
Cleveland	Hamilton Steel Warehouse †Jones & Laughlin Steel Corp., Williams & Co., Inc.
Columbus	Williams & Co., Inc.
Dayton	Ohio Metal & Manufacturing Co.
Toledo	Williams & Co., Inc.

Relief from high handling costs

OKLAHOMA	
Tulsa	Metal Goods Corp.
OREGON	
Portland	†Pacific Metal Company
PENNSYLVANIA	
Philadelphia	†Edgcomb Steel Co. Metal Supply Company Whitehead Metal Products Co., Inc.
Pittsburgh	†Williams & Co., Inc.
York	Edgcomb Steel Co.
RHODE ISLAND	
Pawtucket	Edgcomb Steel of New England, Inc.
TENNESSEE	
Memphis	Metal Goods Corporation
TEXAS	
Dallas	Metal Goods Corporation
Houston	Metal Goods Corporation



Cuts your investment in stock

UTAH	
Salt Lake City	Pacific Metals Co., Ltd.
WASHINGTON	
Seattle	Pacific Metal Co.
WISCONSIN	
Milwaukee	Central Steel & Wire Co. Steel Sales Company of Wisconsin

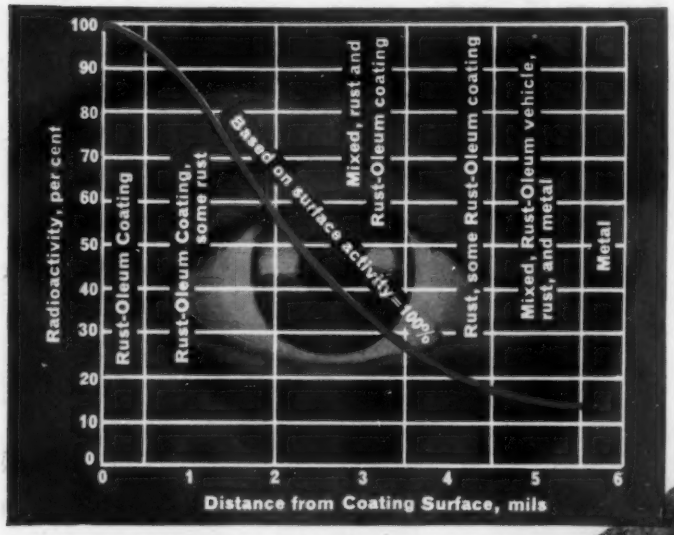
†Home Office.

Your Guide to the Best in Aluminum Value

Always Fasten Aluminum With Alcoa Aluminum Fasteners

For more facts circle 587 on Reply Card

See Rust-Oleum *penetrate rust* to bare metal through the "Eyes" of Radioactivity!



Curved line illustrates Rust-Oleum penetration through rust at each mil level as recorded by Geiger Counter.

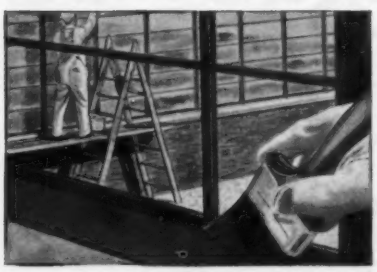
Rust-Oleum dries to a firm, decorative coating that resists salt water, sun, fumes, heat, humidity, and weathering.

Geiger Counter traces Rust-Oleum penetration to bare metal! In nearly three years of radioactive research, Rust-Oleum's *specially-processed* fish oil vehicle was radio-activated and formulated into Rust-Oleum 769 Damp-Proof Red Primer — then applied to rusted test panels. Rust-Oleum's specially-processed fish oil vehicle was then traced through the rust to bare metal by Geiger Counter.

This penetration means rust-stopping power, because the fish oil vehicle works its way into the tiny pits in the metal where it drives out air and moisture that cause rust. Important savings are yours, because Rust-Oleum can be applied directly over sound rusted surfaces — usually eliminating costly surface preparations. Attach coupon to your business letterhead for your copy of the thirty-page report entitled, "The Development of a Method To Determine The Degree of Penetration of a Rust-Oleum Fish-Oil-Based Coating Into Rust On Steel Specimens," prepared by Battelle Memorial Institute technologists. Prompt delivery of Rust-Oleum is assured from your nearby industrial distributor.

There is only one Rust-Oleum. It is distinctive as your own fingerprint.

RUST-OLEUM®



STOPS RUST!

Rust-Oleum is available in practically all colors, including aluminum and white. See our complete catalog in Sweets, or write for information.

For more facts circle 588 on Reply Card

ATTACH TO YOUR LETTERHEAD—MAIL TODAY!

Rust-Oleum Corporation
2724 Oakton Street
Evanston, Ill.

- ☐ Complete literature with color charts.
- ☐ Thirty-page report on Rust-Oleum penetration.
- ☐ Nearest source of supply.

Black & Decker® "95" VACUUM CLEANER IS POWER-BUILT for all-purpose cleaning!

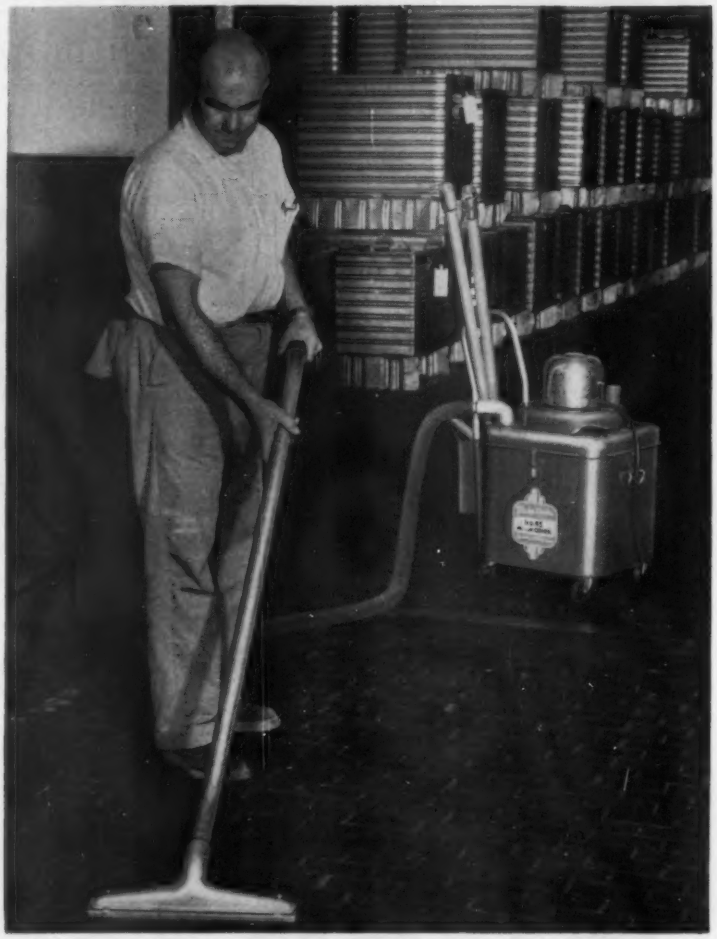
Compactness, versatility and power make the B&D #95 Vacuum Cleaner the finest heavy-duty, all-purpose cleaner for wet or dry industrial use.

The self-contained B&D #95 Vacuum Cleaner rolls easily over rough floors on casters. An extra flexible 15-foot hose reaches out-of-the way spots. You can quickly and easily empty the unit's dirt compartment.

Also available for lighter use, the B&D #65 Vacuum Cleaner delivers 70% - 100% more cleaning power than any comparable unit. A handy Accessory Carrier saves time and steps. For more details on B&D Vacuum Cleaners, see your B&D distributor or write: THE BLACK & DECKER MFG. CO., Dept. 1504, Towson 4, Md.

We don't buy motors – we build them!

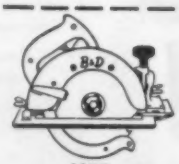
The *heart* of your electric tool is the motor — completely built by Black & Decker! All the power you need *and then some* — because each motor is built for a specific tool and the job it must do! B&D motors always *stand up!*



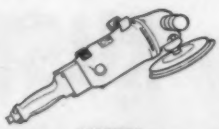
LOOK IN THE YELLOW PAGES UNDER "TOOLS-ELECTRIC"

B&D Black & Decker®
PORTABLE ELECTRIC TOOLS

SERVICE! ... one of 43 Black & Decker factory service branches is located "next door" to you to give fast, efficient service and genuine replacement parts.



SAWS
5 models



SANDERS
6 models

SCREW DRIVERS
21 models

PORTABLE GRINDERS
6 models

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Nicholson *steam trap* quality *gives you* . . .

extra stamina for severest service

Write, today, for your copy of new Bulletin 10-55—for detailed information.

Nicholson quality . . . throughout . . . means the extra strength, extra capacity, extra stamina that never let down. And, Nicholson quality pays off, when it comes to discharging condensate and air from plant steam lines and equipment . . . most efficiently, dependably, economically.

- **powerful valve action—big husky bellows.**
- **positive shut-off—finely ground valve and seat.**
- **high capacity—effective use of large orifice.**
- **each unit service tested—with steam.**

When less than the best won't do, specify Nicholson.

NICHOLSON

W. H. NICHOLSON *and Company*

TRAPS • VALVES • FLOATS • METAL PARTITIONS
LAUNDRY, DRY CLEANING AND PRESSING MACHINERY

14 OREGON STREET, WILKES-BARRE, PA. • SALES AND ENGINEERING OFFICES IN 98 PRINCIPAL CITIES

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HYDRECO Gear-Type Hydraulic Pump

DUDCO Vane Type Double Pump with Valve Panel

In Your Search for MORE...MORE...MORE—Look to FLUID POWER

More pieces per hour, greater precision, more functions from equipment, more goods to more people faster... these are the areas wherein Fluid Power performs today's miracles in production and distribution. Engineers in The New York Air Brake Company are singularly well equipped with "know-how" and experience to answer YOUR problems.

DUDCO-Dual-Vane Hydraulic Pumps and Motors, HYDRECO Gear-type Hydraulic Pumps and Motors, Control Valves and Cylinders run the gamut of Industrial and Mobile Equipment applications... for machine tools; lift trucks; farm and construction equipment; conveyors; oil well, mining or lumbering machinery; for operating winches, cargo booms, hatch covers or steering ships. Name a function on land or sea requiring push, pull, press, raise, lower or rotary motion, and the names DUDCO and HYDRECO are your answer.

In the air—STRATOPOWER Hydraulic Pumps combine amazing weight/horsepower ratios with equally amazing ability to perform dependably at all altitudes and high temperatures.

In Liquid Handling, AURORA Centrifugal and Turbine-type Pumps and KINNEY Heliquad and Rotating Plunger Pumps provide the practical and economical means for moving "anything that will flow through a pipe," from gasoline to asphalt.

KINNEY High Vacuum Pumps, producing pressures down to 0.0001 mm Hg., afford still another important tool to make things better, faster and at lower cost. High vacuum is *the* new technique in many industries.

What are your "MORE" PROBLEMS? Are you fully aware of what The New York Air Brake Company can do to help you solve them?

KALAMAZOO DIVISION
Kalamazoo, Mich.
HYDRECO Gear-Type Hydraulic Pumps, 3 to 120 gpm; Fluid Motors, 3 to 52 hp; Cylinders; Control and Auxiliary Valves; 1500 psi. DUDCO Dual-Vane Hydraulic Pumps, 3 to 120 gpm; Fluid Motors, 7 to 140 hp; 2000 psi operation.

WATERTOWN DIVISION
Watertown, N. Y.
Railroad air brake equipment of all types, STRATOPOWER Hydraulic Pumps for Aircraft, to 3000 psi.

AURORA PUMP DIVISION
Aurora, Ill.
Liquid Handling Pumps, Centrifugals and deep well Turbines, 7000 gpm, 500 ft. heads. Turbine-type, 150 gpm, 600 ft. heads. Condensate Return Units.

KINNEY MANUFACTURING DIVISION
Boston, Mass.
Rotating Plunger and Heliquad Liquid Handling Pumps, to 3000 gpm. Vacuum Pumps, 0.2 micron, evacuate 1800 cfm.

Complete your file of data on new developments in Hydraulic, Liquid Handling and Vacuum Equipment. Write for catalogs today.

THE NEW YORK AIR BRAKE COMPANY

230 PARK AVENUE • NEW YORK 17, N. Y.

INTERNATIONAL SALES OFFICE, 90 WEST ST., NEW YORK 6, N. Y.

For more facts circle 591 on Reply Card

For more facts circle 592 on Reply Card→

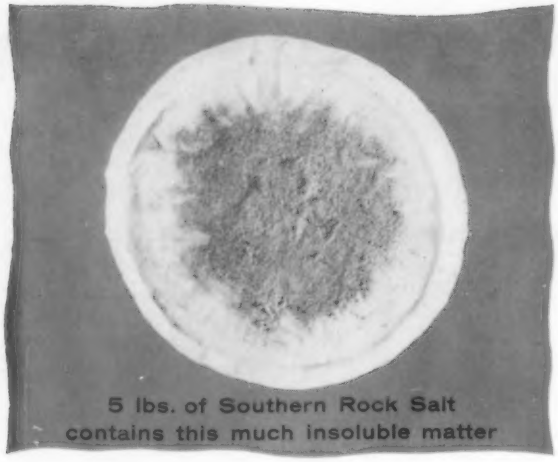
Film censor at work

At 950-acre Kodak Park, the film-producing plant of Eastman Kodak Co. in Rochester, N. Y., they take no chances on film contamination.

For example, in the operation shown here, a red-wheeled Aloyco stainless steel valve rules out of the picture dangerous rust and iron contaminants which would spoil the thick fluid which is called "dope." These valves control the flow of dope onto roll-coating wheels, where solvents are driven off with heat. The dry film base is then readied for the final coat of emulsion.

Today thousands of industrial processes are being safeguarded by Aloyco corrosion and contaminant resistant valves. Find out why their dependable performance makes them first choice for all types of vital flow lines. Write Alloy Steel Products Co., Inc., 1301 West Elizabeth Avenue, Linden, N. J.

Subsidiary of Walworth Company



5 lbs. of Southern Rock Salt
contains this much insoluble matter

5 lbs. of Northern Rock Salt
contains this much insoluble matter

All filter pads shown, approximately ⅓ actual size. Tests for insolubles were taken from random samples.

5 lbs. of Kansas Rock Salt
contains this much insoluble matter

5 lbs. of Morton Purex Evaporated
Salt contains no insolubles

Morton Purex Salt is the only one that contains no costly insolubles

When you buy Morton Purex Salt, you get high purity evaporated salt that is made in a controlled-particle size to prevent packing and channeling. None of your freight bill or purchase price goes toward paying for shale and sulphates . . . insolubles like those shown on three of the filter pads above. (And the cost can be considerable. In every 100 lbs. of any of the types of rock salt shown above, you are paying for up to 5 lbs. of insolubles.)

With Purex, no time or labor is spent cleaning out insoluble matter from your brine making system to keep it functioning at peak capacity. For Purex is 100% soluble. Morton Purex will leave no accumulation of material in either the brine or water softener tanks. It can be used in bulk wet storage systems and in the Morton Model E Brinemaker.

For more information about Morton Purex Salt or for free, expert help on any water softening or brine making problem, write or wire:

MORTON SALT COMPANY
INDUSTRIAL DIVISION
Dept. PLE-4, 120 So. La Salle Street,
Chicago 3, Illinois

For more facts circle 593 on Reply Card

You can pull these plugs at full load . . . SAFELY!

Circuit-Breaking Arktite

PLUGS AND RECEPTACLES

20 amp. to 400 amp.—250V D.C.; 600V A.C.

SAFE at all times—even if you pull an *Arktite* plug to disconnect an energized motor or appliance in an emergency!

You don't have to open the disconnect switch before withdrawing an *Arktite*. Arcs created as line and load poles disengage are confined in deep, insulated arcing chambers—are instantly snuffed out by pressure-deionization and lack of oxygen. There's no possible danger of flashover injuring personnel or destroying property.

Contact your Crouse-Hinds Distributor, nearest Crouse-Hinds Office or Representative for complete information.

NEW, Re-Designed *Arktites*...

Feature new pressure connectors — new easier-to-wire 1-piece interior assemblies — new easier-to-interchange plug and receptacle interiors — new plug adaptability to any type and size cable.

Fully interchangeable with older style. Same price. Currently available in 30 and 60 amp. sizes, in 2-, 3- and 4-poles.

● Operated like a giant switchboard, this *Arktite* installation with variations in power, frequencies and voltages is used to speed up machine tool testing. Plugs can be inserted and withdrawn from "live" receptacles without using a disconnect switch.

A NATIONWIDE DISTRIBUTION exclusively through ELECTRICAL DISTRIBUTORS

CROUSE-HINDS COMPANY

SYRACUSE 1, N. Y.

OFFICES Birmingham Boston Buffalo Chicago Cincinnati Cleveland Dallas Denver Detroit Houston Indianapolis Kansas City Los Angeles Memphis Milwaukee New Orleans New York Philadelphia Pittsburgh Portland, Ore. St. Louis St. Paul San Francisco Seattle Tulsa Washington REPRESENTATIVES Albany Atlanta Baltimore Baton Rouge Charlotte Chattanooga Corpus Christi Reading, Pa. Richmond, Va. Shreveport Crouse-Hinds Company of Canada, Ltd. Toronto, Ont.

CONDULETS • FLOODLIGHTS • TRAFFIC SIGNALS • AIRPORT LIGHTING

For more facts circle 594 on Reply Card

NEW PRODUCTS AND PROCESSES summarized for your convenience

Edited by M. E. Heniken

1—RECEIVER PURIFIER makes exhaust steam reusable

For purifying exhaust steam so that it can be reused for heat exchangers, unit heaters, or for heating or condensate, this receiver-type Hi-eF Purifier is designed for installation in exhaust steam lines from steam hammers, reciprocating engines and other steam equipment. Condensate, oil droplets and other mist entrainment is intercepted from exhaust steam by means of a two-stage principle of separation. In the first stage, the velocity of the exhaust steam is suddenly reduced as it enters the receiver drum. This serves to drop out the larger droplets of condensate and other material. Then the exhaust steam is guided through a multi-stage separating element which removes fine mist by controlled centrifugal action. The V. D. Anderson Co.

2—FLOOR ABSORBENT soaks-up the oil and grease

Called Pickup, this absorbent is described as an all-purpose absorbent with a low density per cubic foot that provides greater floor coverage per bag. Pickup assures absorption of oil, greases, water and acids, says company, and it provides a dry, non-slip floor surface. Manufacturer reports Pickup has been approved by Underwriter's Laboratory and is safe for use on industrial floor surfaces. It is claimed chemically neutral dust-free, and unaffected by heat or cold; also, it can be stored for long periods without caking or deterioration. The Diversey Corp.

More information on any of these products can be yours without cost or obligation. Just circle the item numbers on the Reader Service Cards provided on pages 225-226.

4—POLYETHYLENE TANKS featuring draining faucets

Designed for storing and mixing chemical solutions, these molded polyethylene tanks are equipped with draining faucets. The self-supporting tanks are claimed ideal for electro plating baths, cleaning solutions, and other corrosive media, and their principal advantage is their exceptional service life. The tanks come in four sizes, ranging from 9-by-9-by-9 in. to 17-by-17-by-17 in. The smallest has a 3-gal capacity. American Agile Corp.

5—CONTACT SWITCH KIT for variety of combinations

Providing components necessary for assembly of a wide variety of contact switch combinations, this kit is offered for those who plan to repair or test electrically operated controls. Kit includes compartments containing contact blades, insulators, separators, tension plates, angle brackets, side lugs, nylon lifters, contact rivets, washers, screws and bushings. Standard and midget size blades are furnished. Guardian Electric Mfg. Co.

6—ABRASIVE CLEANER is lightweight, low cost

Announced as the first completely self-contained abrasive cleaning tool, Clemco Educt-O-Matic is designed to replace hand cleaning methods, and its low price puts it in reach of most industries. Its light weight (11 lb, including abrasive)

permits operation inside tanks, on ceilings, floors, cleaning before and after weld and on many other production or maintenance problems. The Educt-O-Matic's features are claimed to provide complete recovery of the abrasive and dust. The cyclone removes the dust into the attached bag and allows the abrasive to re-enter the hopper for re-use. There is no dust or flying abrasive, says manufacturer. A single ½ in. air line is the connection required. The Educt-O-Matic operates on 33 to 60 cfm air supply. No larger or heavier than a small vacuum cleaner, its single control is designed to permit efficient operation by any production worker. Clementina Ltd.

3—BAYONET SAW features orbital motion of the blade

The Model 148 Saw is described as a heavy duty machine that is low in cost and lightning fast in cutting formica, plastics, ferrous and non-ferrous metals, as well as all kinds of hard, soft and plywoods. Its high performance is attributed to orbital action of blade in which the teeth are in contact only on the up or cutting stroke and back away on the release stroke. This blade action eliminates blade breaking heat and friction, it is claimed, and blades stay sharp up to 30 times longer than those on most up and down saws. The new saw has a full 2-in. capacity in wood, ¾ in. in aluminum and a ¼ in. in steel. It is reported to cut 1¾ in. by 11¼ in. white pine in 15 sec.

The Model 148 is designed to permit plunge cuts without drilling starting holes and without blade breakage. It has a comfortable handle that doesn't heat up, company notes, and an auxiliary knob aids in control of cut. The standard wide base provides support for the machine and an accessory base is available for angle cutting. A blower system is provided to keep the line of cut free from sawdust. A trigger switch at the first-finger position on the contoured handle has a lock button for control of power.

The Porter-Cable bayonet saw has a heavy duty 3.5 amp motor for handling the toughest cutting jobs. The saw is 6¼ in. high and weighs 6 lb. It is counter-balanced for ease of handling. Standard equipment for the Model 148 includes a package of blades for cutting wood and metal, a base insert for use in cutting plywood veneer, wrench, tube of grease and instruction manual. The new saw is also being made available in kit form. Porter-Cable Machine Co.

7—CREAM SOAP is almost impossible to waste

SBS-60 is announced as a white, opaque, thick-bodied cream that does not run off the hands when dispensed. SBS-60 can be used in both washroom and shower.

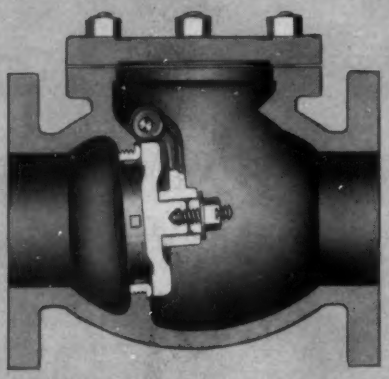
In this cream, synthetic detergent produces cleansing action in combination with other ingredients. The addition of Lanolin provides good skin conditioning, it is noted; and SB-8, a non-toxic, non-irritating deodorizing agent combats body odor. This cream soap is dispensed from a "throw away" container. The manually

Economy Buy for Many Process Services

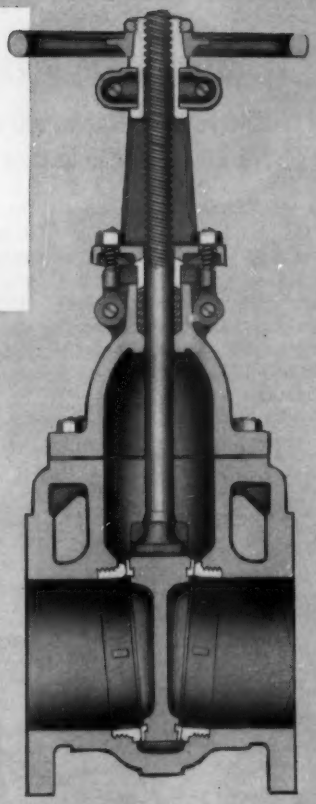
IN FOOD PLANTS, PULP AND PAPER, WOOD TREATING, CHEMICAL, PETROLEUM, ETC.

WORKING PRESSURES: GATES AND CHECKS

12 in. and smaller—200 psi W.O.G.
14 in. and larger—150 psi W.O.G.



Cross section, Check, No. 14493
Flanged ends



Cross section, Gate, No. 14477
Flanged ends

Crane Nickel Cast Iron Valves
IMMEDIATE DELIVERY from Factory Stocks

Why wait for low nickel alloy cast iron valves when you can get Crane quality—at no extra cost—immediately from factory stocks? Gates on hand in sizes: 2″—2½″—3″—4″—6″—8″—10″—12″—14″—16″—18″. Checks in all the same sizes up to 12″ incl. (14″—16″—18″ will be made to order). This delivery offer good while present stocks last.

These valves have an outstanding record in the pulp and paper industry in handling various alkaline liquors. In wood treating they're used successfully on creosote vapors and oils. They're ideal, in the petroleum industry, for handling oils containing traces of mineral acids.

Crane 18-8 SMo alloy trim in these valves combines with nickel alloy body to assure tight seating and smooth, maintenance-free operation. The gates have Crane features such as: full-length disc guides . . . 2-piece ball-type gland . . . and flexible T-head disc-stem connection.

The checks feature all 18-8 SMo trim, including body ring, disc, hinge and hinge pin in sizes 2 to 12 inches. Valves 14 inches and larger have disc same as body, with 18-8 SMo disc faces.

You'll save with these valves, both on original cost and maintenance—and you can get them immediately! Call your local Crane Representative today.

CRANE VALVES & FITTINGS

PIPE • KITCHENS • PLUMBING • HEATING

Since 1855—Crane Co., General Offices: Chicago 5, Ill. Branches and Wholesalers Serving All Areas

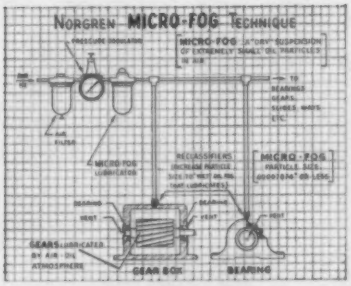
For more facts circle 595 on Reply Card

Better Machine Lubrication Simplified

Norgren Announces the Only Complete Line of Aerosol Lubricators

. . . Now, MICRO-FOG Lubricators are available for 32, 200, 300, and 1000 Bearing Inch Requirements

The Norgren MICO-FOG principle has made practical the application of oil-fog lubrication to large machine tools, lubricating bearings, gears, chains, and other machine parts which always before have been lubricated by splash systems, force feed systems and other methods. Today, Norgren MICRO-FOG Lubricators are providing lubrication for large and small machines in many types of industry.

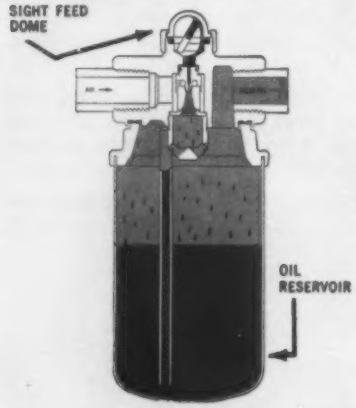


What is Norgren MICRO-FOG?

Norgren MICRO-FOG is an air-borne suspension of extremely small oil particles (.00007874" or less in diameter). Because the oil particles are so small, they can be conveyed long distances through complex piping systems without reclassifying and flooding the lines with oil — a condition heretofore not possible with conventional oil-fog systems.

How is Norgren MICRO-FOG formed?

Air passing through the venturi section of a Norgren MICRO-FOG Lubricator creates a pressure differential that draws oil from the reservoir. The oil is allowed to flow at a controlled rate into the venturi section.



The venturi creates an oil fog, discharging it into the upper regions of the oil reservoir. The heavier particles of oil return to the oil supply. Only the finer particles of 2 microns (.00007874") or less are carried into the air line.

CONTROLS AND FILLER PLUGS EQUALLY ACCESSIBLE FROM BOTH SIDES
360° VISIBILITY OF OIL FLOW
OIL SUPPLY VISIBLE
1 QT. OIL CAPACITY
Norgren Micro-Fog
Model S3406-8S
300 BEARING INCH CAPACITY

Now—A Lubricator for every requirement

New models of MICRO-FOG Lubricators, having 200 and 300 bearing inch capacities, are now being manufactured by Norgren. These are in addition to the 32 and 1000 bearing inch capacity lubricators already in the Norgren line. The range of bearing inch capacities given by these models means that you can select a lubricator that will provide the most efficient lubrication for the job.

For complete information about Norgren MICRO-FOG Lubriation, call your nearby Norgren Representative listed in your telephone directory — or WRITE FOR NEW No. 700 CATALOG.

C. A. Norgren Co.
3443 So. Elati, Englewood, Colo.

For more facts circle 596 on Reply Card

NEW PRODUCTS

(Begins on page 160)

operated dispenser meters out the correct amount for a hand wash and discourages wasteful usage. Manufacturer estimates that one of these dispensers replaces from three to six conventional-type soap dispensers. Sugar Beet Products Co.

8—STEP LADDER for extra heavy duty

The Super/Craft Step Ladder, designed for extra heavy duty use by plasterers, plumbers, and maintenance crews in industrial plants, is claimed to equal or exceed specifications of the ASA safety code. Because of its over-size front rails and rear legs, it is said to withstand considerable abuse without weakening. Other features include heavy duty horseshoe hinge, zinc-plated hardware, and heavy duty top bracket. All steps are doubly supported by truss rods and knee braces; top and bottom rungs are supported by pressed steel braces, with an intermediate set on 10-ft and 12-ft sizes. Ladders are available in sizes 4 to 12 ft. Bulletin L-84 gives more details on them. The Patent Scaffolding Co., Inc.

9—GAGE CASE designed for increased safety

Announced as providing maximum safety on dangerous installations, the Safecase has a solid front to protect the gage face, and a thin stainless plate, covering the entire back of the case, to relieve

explosive pressures. The back plate is held to the base by two holding screws to eliminate possibility of the back plate becoming detached in the event of a blow-out. Manufacturer reports that in experimental tests, blank cartridges were fired into the gage, and the glass face didn't even crack; the thin metal back plate folded outward and the force was safely exhausted out of the back of the case. Jas. P. Marsh Corp.

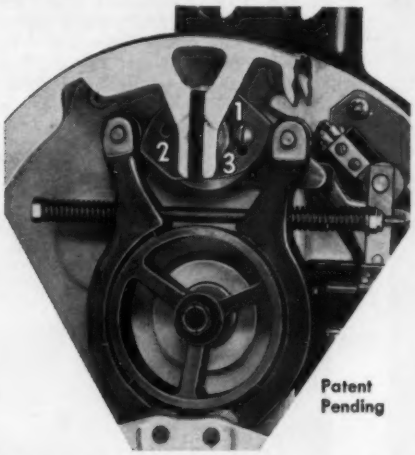
10—SHATTERPROOF GLAZING reduces maintenance

Structoglas glazing is claimed shatterproof, weather resistant and extremely lightweight (0.080 in. thickness). It can be installed more quickly, easily and

For more facts circle 597 on Reply Card ——→

ACCO products

The WRIGHT Hoists for Dependability



Patent Pending

Nothing to adjust but the cam!

Here's your assurance of maximum hoist service—minimum downtime. Adjustment of this cam-actuated brake to compensate for brake lining wear is simple as ABC.

When excessive load hook drift occurs...remove the screw shown at Position 1 (*see picture*), swing the cam until Position 2 is in line and replace the screw. That's all there is to it. For the final third of brake lining wear, set the cam at Position 3.

This is the only adjustment required. Brake springs and solenoid are factory-set and never need adjustment.

for complete information on WRIGHT Hoists and Crane components ask for:

Speedway Hoists: *(Frame 1) Booklet DH133B, (Frame 2 & 3) Catalog E55A* • ***Motor Driven Cranes:*** *Underhung, Single Bridge, Bulletin #227; Top Running, Bulletins #DH448 or DH449* • ***Crane Drive Units:*** *Booklet DH-431A* • ***Hand Traveling Cranes:*** *Bulletins #DH-469 and #DH-438A*

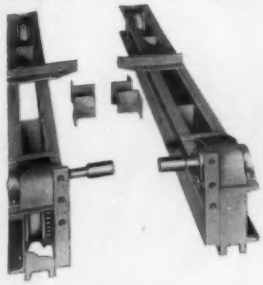
Write our YORK, PA., office

HOISTS, CRANES AND DRIVE UNITS TO FIT YOUR OPERATION

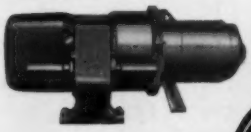
WRIGHT *Speedway* Hoists are designed to meet the many and varied demands of modern high speed production.

They are available in Frame 1, 1½, 2 and 3 sizes with capacities from ¼ to 10 tons.

WRIGHT B-514 Crane End Trucks are constructed of structural steel-welded steel channels equipped with heavy channel diaphragms. Truck wheels are equipped with Timken Tapered Roller Bearings (two to each wheel).



WRIGHT Crane Drive Unit consists of an electric motor with a fluid coupling transmitting power to a well proportioned gear reduction. It is designed for crane and double-beam trolley propulsion and similar intermittent duty reversing applications.



ACCO

Wright Hoist Division

AMERICAN CHAIN & CABLE

York, Pa., Atlanta, Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

Better Value

CORROSION PROBLEMS SOLVED...COMPLETELY

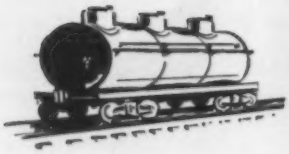
Tanks . . . Floors . . . Fume exhaust systems . . . anywhere in your plant where corrosion can cause lost time and money, Atlas is prepared to offer their complete service. From on-the-spot technical advice through enginering design to complete construction facilities to carry the job from beginning to end, Atlas can help you with your corrosion problems.

ON THE SPOT TECHNICAL ADVICE

Representatives located in major cities throughout the United States will call at your plant, look over your corrosion problems and prepare suggestions for solving them.

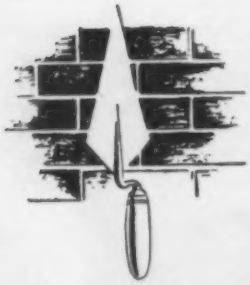
ENGINEERING DESIGN

Engineering facilities at the Atlas home office are geared to provide recommended design features, based on a quarter century of experience in the field.



HIGHEST QUALITY MATERIALS

Atlas time-tested corrosion proof materials of construction are your assurance of long term service. The controlled manufacture of Atlas materials maintains the highest standards of quality.



COMPLETE CONSTRUCTION FACILITIES

The most complete corrosion proof construction facilities available are maintained by Atlas. Shop and field fabrication, installation and follow-up service assures you of complete interest in your problems.

Write for your copy of Atlas Bulletin CC#3 containing informative data on the complete Atlas line.

ATLAS MINERAL PRODUCTS COMPANY
MERTZTOWN, PENNSYLVANIA

For more facts circle 598 on Reply Card

NEW PRODUCTS

(Begins on page 160)

safely than glass, it is noted, because its high impact strength eliminates need for careful handling. This new translucent glazing reduces the glare and heat of direct sunlight without reducing interior lighting efficiency, manufacturer announces, and it affords savings in heating and air conditioning costs because of superior insulating qualities. Structoglas glazing panes are available in green, blue or clear (translucent) color. Featuring a "pebble-grain" surface, Structoglas panes are supplied in standard sash sizes, are packed 50 per carton. Bulletin SL-51 gives details. The Structoglas Div., International Molded Plastics, Inc.

11—WIRE BASKETS for small parts handling

Wire baskets are a recent addition to the NesTier line of parts handling equipment. Standard sizes offered range from 18-by-10-by-3 in. to 24-by-14-by-12 in. Special baskets and inserts can also be

made. Particularly adapted for handling fragile or highly finished parts, these wire baskets are also suggested for use when parts within a container need to be positioned for easy withdrawal for production or assembly operations. The baskets are furnished in bright basic steel wire, they are also available in other materials, including stainless steel. A variety of wire sizes is offered, ranging from No. 16 to ½ in. Baskets can be supplied zinc plated or finished in a variety of plastic coatings. Either nesting or stacking designs are available, with fixed or movable handles. The Chas. Wm. Doepke Mfg. Co., Inc.

12—LEVEL INDICATOR for the process industries

This material level indicator functions at bin temperatures to 300 F, it is announced. Suitable for all dry, pulverized, crushed or granular materials, it can be adapted for use with corrosive materials. The indicator may be mounted vertically or horizontally. Indicator mechanism is a paddle wheel rotated by a 10-w motor. When incoming material reaches the paddle wheel level, shaft movement is restrained. The motor, located externally, revolves on its shaft until it contacts two micro switches which flash a signal to operator or directly to feed supply.

It is explained that because the motor frame must rotate through a considerable distance before contacting the switches, false signalling, caused by clumps of material striking the paddles, is avoided.

NEW!

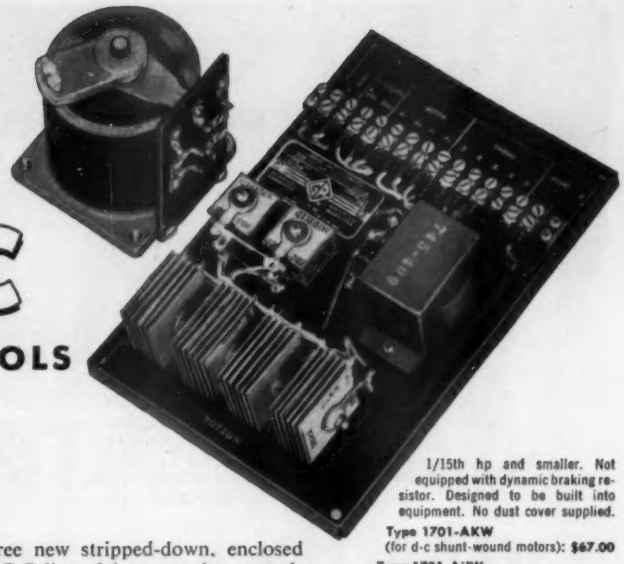
Stripped-Down, Low-Priced

Variac®

MOTOR SPEED CONTROLS

for 1/6, 1/3 and 3/4 hp

D-C Motors on A-C Lines



1/15th hp and smaller. Not equipped with dynamic braking resistor. Designed to be built into equipment. No dust cover supplied.

Type 1701-AKW
(for d-c shunt-wound motors): **$67.00**

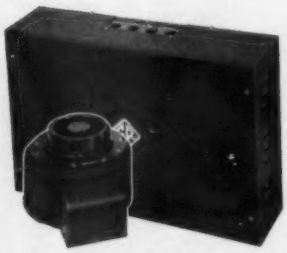
Type 1701-AUW
(for series or universal motors): **$67.00**

1/6th hp. Completely enclosed, with dynamic braking. **Type 1703-BW: $97.50**

The addition of three new stripped-down, enclosed models now makes the G-R line of these popular controls available in seven simplified units for controlling d-c motors from 1/15th hp to 1½ hp.

VARIAC® Motor Speed Controls Feature:

★ Extreme Simplicity ★ Exceptionally Long Life ★ Essentially Maintenance-Free Operation ★ Easy Installation ★ Very Low Torque Pulsation ★ Heavy Overload Capacity for Fast and Repeated Starting ★ Dynamic Braking for Extra Fast Stopping and Reversing ★ Smoothly Controlled Torque for Delicate Starting Operations ★ Selenium Rectifiers — No Electron Tubes — No Warm-Up Time — Controls Operate Instantly When Power is Applied ★ ANY Speed Desired — Multi-Step Pulleys and Gears no Longer Needed



1 hp. Completely enclosed, with dynamic braking. Overload breaker mounted in VARIAC control. **Type 1704-BW: $308.00**

1/3 hp. Completely enclosed, with dynamic braking. **Type 1700-CW: $145.00**

User supplies switching for all the stripped-down models, and overload protection in addition on models through ¾ hp. The 1 and 1½ hp stripped down controls have thermal overload relays in the VARIAC case. Models under 1/6 hp rating do not include braking resistor.

Switching is easily provided for all requirements. Among the simple arrangements are:

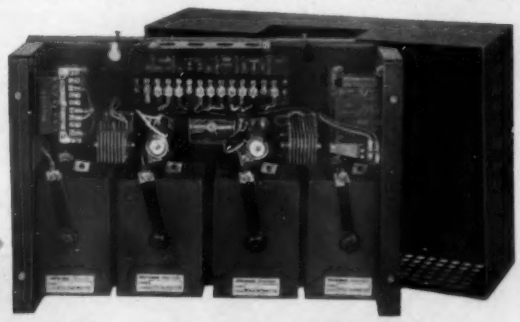
★ Appliance-type switch with contacts to break a-c and d-c circuits simultaneously and also handle reversing and dynamic braking. ★ Drum-controller type for heavy-duty machine shop operation. ★ DPDT toggle switch, where reversing is never required, for starting and stopping with dynamic braking. ★ Limit switch of the manual-resetting, snap-action type to stop a machine at a predetermined point. Switch will stay in "Off" position while machine is being set up; reset button used for re-starting.

1½ hp. Completely enclosed, with dynamic braking. Overload breaker mounted in VARIAC control. **Type 1705-BW: $358.00**

¾ hp. Completely enclosed, with dynamic braking. **Type 1702-BW: $205.00**

All of the VARIAC Motor Speed Controls illustrated are available in complete models. Complete models are identical with the stripped-down units with the addition of an A-B Drum-Type Controller. Smaller models have the switching mounted directly on the panels, and are equipped with panel-mounted overload protection.

Accompanying prices are for 1 to 4 identical controls. Substantial discounts apply for larger quantities.



Inside of Types 1704-BW and 1705-BW showing convenient wall mounting slots, ventilated dust cover and plainly marked wiring terminals. Dust cover readily removed for occasional maintenance.

Write for the NEW MOTOR CONTROL BULLETIN

GENERAL RADIO Company®

275 Massachusetts Avenue, Cambridge 39, Massachusetts

90 West Street **NEW YORK 6** 8055 13th St., Silver Spring, Md. **WASHINGTON, D. C.**
1150 York Road, Abington, Pa. **PHILADELPHIA**
920 S. Michigan Ave. **CHICAGO 5** 1000 N. Seward St. **LOS ANGELES 38**

For more facts circle 599 on Reply Card

Here a 5,000-hp Skinner marine engine is being assembled. A *Snap-on* L-78 1½" drive ratchet wrench is used to tighten a 1¾" nut. A similar wrench is also part of the tool set which goes to sea with this engine.

SEAWORTHY HAND TOOLS

How *Snap-on* Specialist Helped Skinner Modernize Marine Engine Tool Kits, Cut Costs

KENNETH GRAY

Skinner Engine Co., Erie, Pa., marine engine builder, recently decided: "Let's throw out the old-fashioned hand tools we're shipping with our marine engines and get modern tools that really match these units."

They called in Kenneth Gray, *Snap-on* sales engineer. Gray, working with Skinner's chief draftsman, R. M. Whiting, not only consulted with the plant superintendent but also checked with the men on the assembly floor. *Snap-on* tools are used to assemble the engines and Gray wanted to see which tools were used most.

Today a modern set of *Snap-on* tools goes out with every Skinner Marine engine. These tools not only save maintenance time but are stronger and safer than the old ones. In addition, the *Snap-on* socket wrench set costs less than the old kit.

What Is Your Problem?

Are you satisfied with tools going out with your product? Are you making costly special tools for your own production or maintenance work that standard *Snap-on* tools might do at far less cost? Whatever your tool problem, call in the *Snap-on* man. He is a specialist on industrial application of *Snap-on* tools. Write us or call the nearest *Snap-on* branch. Free catalog of industrial wrench and hand tools is yours for the asking.

*Snap-on is the trademark of Snap-on Tools Corporation.

SNAP-ON TOOLS CORPORATION

8068D 28th Avenue • Kenosha, Wisconsin

For more facts circle 600 on Reply Card

NEW PRODUCTS

(Begins on page 160)

Even when the paddle is held stationary by the material, electric current to motor is not interrupted, says company. For low-level control, when a bin is being unloaded, the paddle wheel is held motionless—and the motor held against the switches—until the material restraining it falls away. A tension spring then returns the motor to its original position and the paddle revolves. The micro switches can control numerous combinations of circuits for shutting off the material flow. Fuller Co.

13—PIPE INSULATION for hot and cold lines

This low pressure pipe insulation for cold, hot water and low pressure steam lines contains a ½-in. thickness of fine fibered Fiberglas insulation and a jacket of heavy, bleached, creped Kraft paper laminated to aluminum foil. Outer surface is off-white in color and no additional finish is needed, although jacket may be painted. Light in weight, made of fibers that are inorganic and dimensionally stable, company says the product will not rot or shrink. It is manufactured in two equal sections and can be installed at less than normal application expense, company notes. Its "k" value is said to average 0.24 Btu at 75 F mean temperature. Product is designed for 50 to 250 F use.

For installation on hot lines, metal bands, stapling or other methods are used; for cold lines, the insulation is adhered with white vapor barrier adhesive. Sizes are ¼ through 12 in. for iron pipes and ½ in. OD through 4⅛-in OD copper tubing, furnished in 36-in. lengths. Owens-Corning Fiberglas Corp.

14—CONTROL PANEL for air conditioning systems

Master Control Panel RS-108 provides automatic centralized control of air conditioning (central heating/cooling) systems. All components—transformer, relays, pressure switches, motor contactors and other electrical controls—are located in this compact unit, and are prewired to accessible terminal blocks. Low voltage terminals of this UL approved control unit are isolated from the high voltage terminals, it is pointed out; and installation, testing and servicing are easily accomplished.

Standard models of this panel come

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STEEL KITCHENS for THE HOME

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- Shelving
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- Stools
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- Cabinet Benches
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- Drawing Tables
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- Filing Cabinets
- Hanging Cabinets
- Folding Chairs
- Coat Racks
- Work Benches
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- Service Carts
- Sorting Files
- Drawer Units
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ALGAS

brings Stand-by LP-Gas fuel to

HARVEY Aluminum

Here's another leading industrial firm that has turned to ALGAS for LP-Gas stand-by fuel service as a safeguard against natural gas shortage or sudden interruption of service.

This LP-Gas stand-by plant at Harvey Aluminum, Torrance, Calif., was designed to provide 180,000 gallons of LP-Gas storage. Like all other ALGAS installations, this job was engineered to meet specific requirements. Our engineering staff is fully qualified to offer recommendations for the type and capacity of equipment needed for your plant. Mail the coupon below for complete information.

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Please furnish us complete information regarding your LP-Gas stand-by plant equipment.

Firm_____

Address_____

City_____ Zone___ State_____

For more facts circle 602 on Reply Card

NEW PRODUCTS

(Begins on page 160)

in various contactor ratings, with and without integral dual pressure control —manual, automatic or remote electrical reset after tripout, operating relays and motor starting relays for use on refrigeration units or on combination heating and cooling equipment. Units are available for pilot duty to 5 and 10 hp in single and three phase respectively. General Controls Co.

It's easy to obtain product data with the postage-free Reader Service Cards provided on pages 225-226. Use them for information on advertised products, too. Just circle the key number appearing at bottom of the ad.

15—SYNTHETIC HOSE for use in elevated temperatures

Constructed entirely of synthetic materials, this lightweight hose can be used effectively at elevated temperatures, it is announced. It is said to be capable of handling air continuously at temperatures up to 400 F and working pressures of 100 psi. It can be made with inside diameters from ¾ to 5 in., in lengths to 50 ft. Hose is described as exceptionally strong, lightweight and flexible. Quaker Rubber Div., H. K. Porter Co., Inc.

16—LIQUID COOLERS are completely assembled units

These packaged liquid coolers are designed to produce chilled liquids in volume, quickly and at low cost. Package includes a complete refrigeration cycle, compressor, motor and starter, refrigerant controls, liquid cooler, condenser, piping, wiring and insulation, shop assembled and tested, ready for quick installation and immediate operation. The units are available in a range of sizes from 5 to 100 hp and for temperatures from 65 to —100 F. The Doyle & Roth Mfg. Co., Inc.

17—DIE CASTING MACHINE is high speed unit

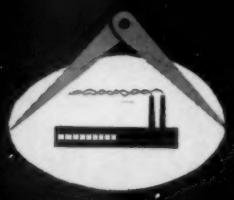
This low cost, high speed die casting machine handles shot capacities up to 2½ lb, says manufacturer, and it has workmanship of larger machines. Other outstanding features announced include: all steel welded construction, 80 ton locking pressure; automatic electric cycling at high speed (up to 700 shots per hour); 6½ in. die stroke; blast type furnace blower; moving platens supported by bronze carrier shoes; controls and valves mounted for easy maintenance. It is available in air or hydraulically operated plunger goose neck type for zinc, tin and

For more facts circle 603 on Reply Card——→

Using

DU PONT ELASTOMERS

NEOPRENE - HYPALON®



in Industry

Brine, animal fats no threat to durable NEOPRENE truck tires

Hand-truck tires are subjected to such severe exposure conditions in a meat-packing plant that conventional rubber tires have to be replaced in a matter of months. They are constantly rolling over brine, animal fats and blood . . . in fact, the floors are so greasy in places that salt is sprinkled on them to prevent slipping.

The C. D. Moyer Co. of Silverdale, Pa., has solved its tire replacement problems with the help of neoprene. Here is the report of the company's plant superintendent. "Rubber tires used to swell up and jam the wheel within a few months. We've had no trouble at all since switching to neoprene *8 years ago*." Neoprene tires are now standard at Moyer's, not only in the lard and meat-processing area, but even on the package hand truck in their warehouse.

Neoprene offers you cost savings wherever operating conditions demand extra resistance to oil, grease, chemicals, heat and outdoor exposure. Mail the coupon for further information about neoprene.

NEOPRENE TIRES have been in service 8 years in this meat-packing plant. Rubber tires previously used lasted only a few months.

HYPALON doubles service life of belt exposed to 300°F.

Previous belt life was maximum of 3 months

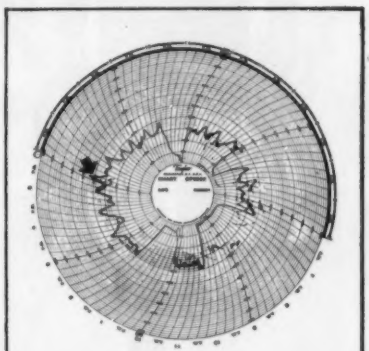
Engineers at a large chemical plant were confronted with the problem of finding an elevator belt that would resist extremely high temperatures. The belt had to lift hot salt from a rotary drying kiln to a loading platform. Average temperature of the salt was 300°F. so that even the best rubber belts were lasting only three months. Heat caused embrittlement and cracking of the rubber where the monel buckets were attached to the belt. Soon the belt ruptured.

The answer to the problem was a specially designed hot-materials belt covered with HYPALON, Du Pont's new synthetic rubber. The HYPALON-covered belt lasted six months—twice as long as previous belts—despite the fact that the belt is fully enclosed and in operation about 80 hours a week.

This is just one example of the *extreme service conditions* for which HYPALON is especially suited. It demonstrates that HYPALON, compared to other kinds of rubber, shows unusual resistance to hardening at elevated temperatures (250°F. to 350°F.).

OTHER ADVANTAGES

HYPALON also is completely resistant to ozone and has excellent resistance to strong oxidizing agents. In addition, it resists abrasion, weathering and flex cracking. For these reasons, HYPALON can help reduce plant maintenance costs.



HYPALON-covered elevator belt resisted salt temperatures averaging 300°F. for six months. Chart above shows a peak temperature of 518° F. (arrow).

DU PONT
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BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

Please send further information and add my name to the mailing list for your free publications, the "Neoprene Notebook" and "Facts about HYPALON®," which show how the Du Pont elastomers are used to cut maintenance and replacement costs, improve production.

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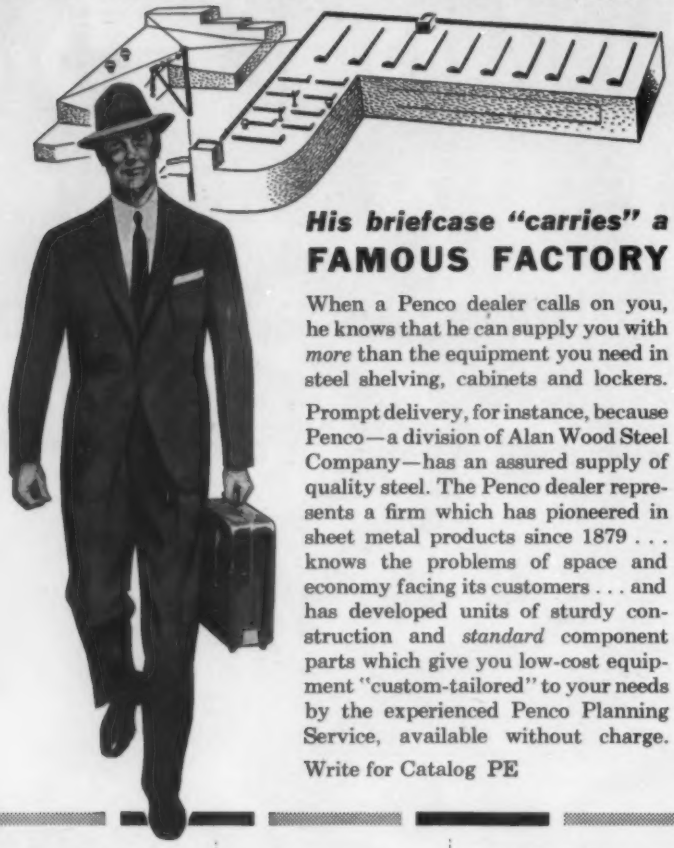
penco—There's Economy in The **RIGHT** Equipment



His briefcase "carries" a
FAMOUS FACTORY

When a Penco dealer calls on you, he knows that he can supply you with *more* than the equipment you need in steel shelving, cabinets and lockers.

Prompt delivery, for instance, because Penco—a division of Alan Wood Steel Company—has an assured supply of quality steel. The Penco dealer represents a firm which has pioneered in sheet metal products since 1879 . . . knows the problems of space and economy facing its customers . . . and has developed units of sturdy construction and *standard* component parts which give you low-cost equipment "custom-tailored" to your needs by the experienced Penco Planning Service, available without charge.

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penco
Steel Shelving

puts efficiency at your workers' fingertips. Its variety of standard sizes and interchangeable units makes possible a flexibility of arrangement that will exactly meet your needs.

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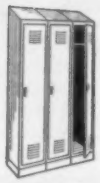
Steel Cabinets

the Quality line—offers a complete range of sizes . . . all with adjustable shelves . . . in storage, wardrobe, combination, counter-high, desk-high, and tool cabinets.



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the Perma-Built Line—enable your dealer to offer you more than 60 types and sizes. You'll find a design that fits your space needs and gives satisfaction to your workers.

Planning for Your Service—Swift Service for Your Plans

Penco specialists in storage equipment engineering are available—at no cost to you—to assist in planning an efficient, practical shelving installation to meet your needs.

As a division of Alan Wood Steel Co., steelmasters for 130 years—Penco is assured the full supply of high-quality steel which enables it to make prompt delivery on all orders.

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ALAN WOOD STEEL COMPANY
Oregon Ave. & Swanson St. • Philadelphia 48, Penna.

For more facts circle 604 on Reply Card

NEW PRODUCTS

(Begins on page 160)

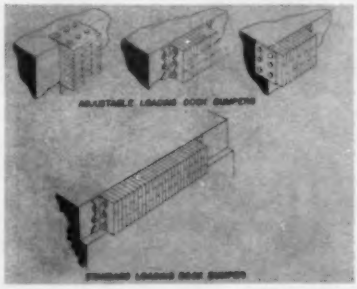
lead, or, cold chamber type for aluminum, brass and magnesium. Either standard or fire-resistant fluids may be used in the hydraulic unit. American Die Casting Machinery Co.

18—HANDLE-BAR UNION is lightweight, compact

This 4-in. handle-bar union is announced as lightweight and compact, for production piping to 1000 lbs cold working pressure. The short 5-in. height, 15-lb weight, four-lug nut, API threaded ends and an interchangeability factor combine to provide greater convenience and ease of handling for many piping problems. The 4-1000 Bulletin contains detailed information and prices on this union. Clayton Mark & Co.

19—BUMPERS reduce loading dock and truck damage

Flex-O Loading Dock Bumpers, constructed of reversible rubber-coated fabric, are designed to minimize loading dock and truck damage and subsequent maintenance costs. The bumpers are made in four sizes with standard lengths of 14 and 36 in. and a standard thickness of 4½ in. They are designed to cover a



facing depth of 6, 9 or 12 in. A pair of bumpers is declared adequate for any single dock. The rubber coated fabric will remain resilient even when frozen, it is claimed, and the bumpers require no additional cover. Ice shales off on the first impact. The units have reversible brackets which permit the user to reverse the fabric to obtain double product life.

Easily installed, these bumpers can be bolted to wooden docks, welded to steel plates or lagged to concrete facings. Two designs are available for adjustable loading docks, one with brackets at each end, the other with a bracket at one end and a plate on the other. Bumpers, Inc.

20—PULLEY LAGGING has an anti-slip surface

Developed to prevent pulley slippage on belt conveyors operating on steep slopes or under wet service conditions, this rubber lagging has a grooved anti-slip surface similar to the tread of snow and ice tires used on automobiles. Thousands of

BEFORE YOU BUY A PACKAGE BOILER

CHECK THIS LIST!

If you need a package boiler, the list at the right can give you some interesting answers. Of course, C-E's Type VP Boiler rates a "yes" answer to every question. It offers also many other operational advantages, such as simple, effective soot blowing; high heat absorption; low draft loss, no dead gas pockets and simple baffle arrangements.

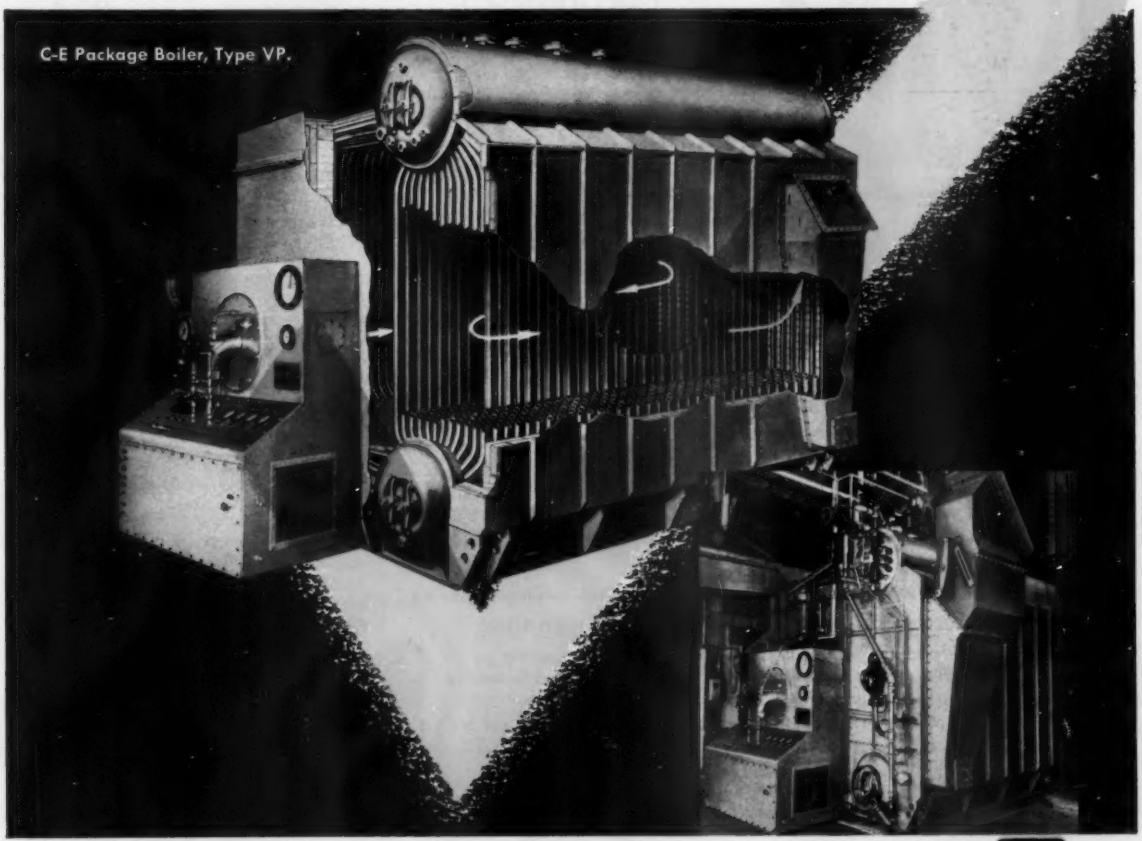
That's why VP purchasers range from small companies to some of the nation's largest – plus schools, institutions, government agencies, including the Atomic Energy Commission. These users employ VP Boilers for all types of applications – heating, process, even power generation.

SPECIFICATIONS OF THE VP BOILER

Capacity — 4,000 to 40,000 pounds of steam per hour
Pressures — up to 500 pounds per square inch
Fuel — oil or gas
Erection — completely shop-assembled
Foundation — simple concrete slab

Have full details on the VP next time you are in the market for a boiler of moderate capacity. Get the new Catalog VP-258, which contains specifications, and information on dimensions, construction details and controls. B-845A

	BOILER A		BOILER B		BOILER C	
	Yes	No	Yes	No	Yes	No
Will your boiler be a real "package" type with control panel and all controls mounted integral with the boiler?						
Will your package boiler be equipped with drum internals to assure dry steam?						
Will its "steam quality" be backed with a guarantee?						
Will your boiler have a 30-in. lower drum to provide convenient accessibility?						
Will yours be a one-burner boiler, with a simple wiring and control system?						
Will your boiler have the largest load swing range available?						
Will your boiler be equipped with a quiet centrifugal fan?						
Will your furnace be *completely* water-cooled?						
Will your furnace have the highest ratio of water cooled surface to furnace volume?						



C-E Package Boiler, Type VP.

COMBUSTION ENGINEERING

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BOILERS, FUEL BURNING & RELATED EQUIPMENT; PULVERIZERS, AIR SEPARATORS AND FLASH DRYING SYSTEMS; PRESSURE VESSELS; AUTOMATIC WATER HEATERS; SOIL PIPE

For more facts circle 605 on Reply Card

CM Lodestar®

ENTIRELY NEW differently NEW

FLEXIBLE LINK CHAIN

PUSH-BUTTON CONTROL

FEATURING:

- Push Button Control
- Ultra-Modern Regenerative Electric Braking
- Self-Adjusting Heavy Duty Magnetic Brake
- Sealed-in Lifetime Lubrication
- Overload Protection
- Fully Enclosed Components
- Lowest Headroom
- "CM-Alloy" Flexible Link Chain

CAPACITIES: from ⅛ to 1 ton. Single and 3 phase. ¼ ton model weighs only 51 pounds.

$149.50 and up
F.O.B. Factory

Built to serve you without costly maintenance

Lodestar is the first truly "heavy duty" version of the small electric hoist. The CM Lodestar is designed to operate without costly maintenance or interruptions in your work schedules. The initial cost is practically your only cost with a Lodestar... an extremely low cost indeed!

WRITE US or call your CM distributor for literature, prices and quick delivery from stock.

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REGIONAL OFFICES: NEW YORK • CHICAGO • CLEVELAND
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CM HOISTS AND CHAIN

For more facts circle 606 on Reply Card

NEW PRODUCTS

(Begins on page 160)

diamond-shaped rubber grippers press against the underside of the conveyor belt and minimize slippage when power is applied through the pulley. Called Maltese Cross Double Chevron Pulley Lagging, the new product is reinforced with two layers of heavy fabric on the back to provide added strength. It will be furnished in widths to fit all types of pulleys. Hewitt-Robins, Inc.

21—ADDITIVE for moisture-proofing masonry surfaces

Addition of only 2 to 4 per cent of Losorb—a moisture-proofing additive—is said to permanently decrease by about 50 per cent the permeability of concrete blocks, mortar, plaster, stucco and concrete. It is also designed to minimize crack frequency, make the mix more plastic and easier working, act as a lubricant in molding, minimize shrinkage in curing, and prevent stucco from drying and cracking before the concrete base cures thoroughly. According to company, industrial steel supported on concrete treated with Losorb is permanently protected from corrosion by moisture absorbed from the earth. Pennsylvania Industrial Chemical Corp.

22—PNEUMATIC STRETCHER for irregular packages

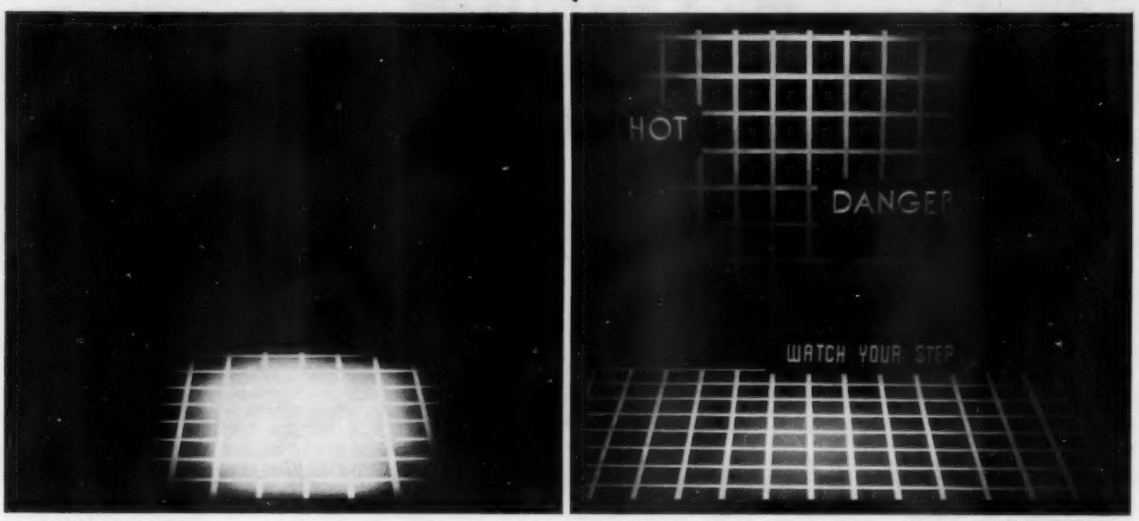
Specially designed for use on round or irregular packages, where strapping surface is limited, is the PNK Pneumatic

Stretcher. Operator fatigue is reduced with it, says manufacturer, because the degree of tension is controlled by air pressure. The tool was developed for production line applications using 5/8-in. and ¾-in. tensional strapping. Weight of the stretcher is 6 lb, 11 oz. Brainard Steel Div., Sharon Steel Corp.

23—SYNTHETIC LUBE is odorless, won't get rancid

Hamikleer 1391 is reputed to dissolve instantly in any kind of water to make a clear, thin, odorless lubricant with good wetting properties, excellent heat absorbing and convection properties, and protection against rust. Manufacturer says this product increases tool life because of its lubricity and anti-weld properties, and it facilitates metal-working operations on all ferrous metals including cast

Here's dramatic, positive PROOF!



GLASS

Unretouched photos of identical setup taken with same camera, film, light source, exposure and processing time. Sworn affidavit available.

ALSYNITE FLAT PANE (LITE BLUE)

Alsynite FLAT PANES GIVES MORE *EFFECTIVE* DAYLIGHTING

Take a look at this graphic comparison of harsh daylight as it pours through clear glass, and the soft, diffused, *usable* light transmitted by Alsynite translucent fiberglas Flat Panes.

In the intense direct light admitted by glass, too much light causes glare in a limited area—surrounding areas are in dangerous shadows.

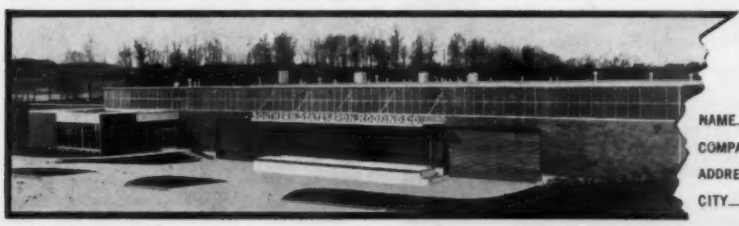
But with Alsynite Flat Panes the same amount of light is converted into *effective daylighting!*

You can see it for yourself in these photographs, but more important, consider what this can mean in your own plant—no glare to cut worker efficiency, no shadows that can lead to serious injuries, lower artificial lighting cost.

And with these amazing fiberglas panes there's no replacement problem—*Alsynite is shatterproof.* Put a stop to the big expense of glass replacement with Alsynite Flat Panes.

No need to paint, either. Colors are built right into Alsynite, and there are now *six* scientifically-selected colors available, each designed to handle your specific lighting problem, whether you have a "hot" side or a gloomy area situation. Standard colors now available are: Clear, Lite Blue, Lite Green, Rose, Cool Blue and Cool Green.

With all these money-saving advantages—no breakage, no painting, better lighting, less artificial lighting—Alsynite can make your plant more efficient, make it as modern as tomorrow. Write for the full story of Alsynite Flat Panes.



ALSYNITE COMPANY OF AMERICA, DEPT. D-13, SAN DIEGO 9, CALIFORNIA

Send me full information on Alsynite Flat Panes

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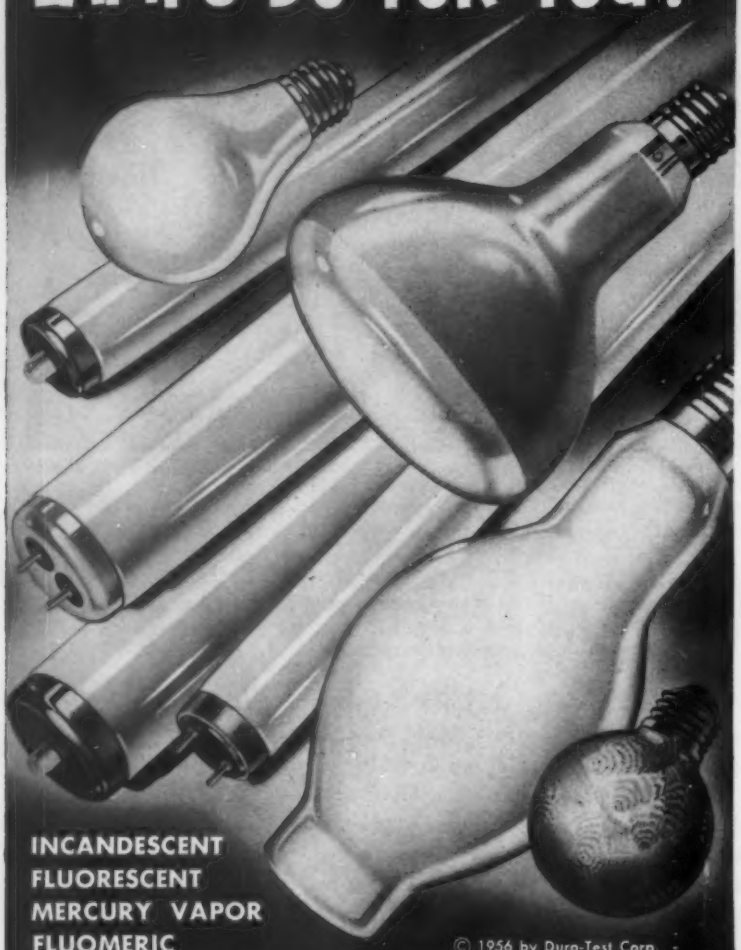
COMPANY_____

ADDRESS_____

CITY_____ STATE_____

For more facts circle 607 on Reply Card

WHAT WILL DURO-TEST LAMPS DO FOR YOU?



INCANDESCENT
FLUORESCENT
MERCURY VAPOR
FLUOMERIC

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DURO-TEST LAMPS WILL CUT YOUR LIGHTING COSTS because they burn up to five (5) times longer than conventional lamps. Specially designed for heavy industrial and commercial uses, they give you far more light for your money. Extra-careful construction and stronger, more expensive parts have established the world-wide reputation of Duro-Test lamps' higher lumen maintenance and longer life. They cut down appreciably the need for new lamps and frequent replacement labor costs.
Give your budget a break—use Duro-Test lamps.

DURO-TEST CORPORATION
NORTH BERGEN • NEW JERSEY

Warehoused in principal cities for prompt shipment

DURO-TEST ELECTRIC, Ltd.
Gurney Crescent, Toronto, Canada

For more facts circle 608 on Reply Card

NEW PRODUCTS

(Begins on page 160)

iron and cast steel. The lubricant cannot decompose, turn rancid during use or affect workers' skin, it is claimed; it will not gum, become tacky or foam, and it can be run down drains without special treatment if oils do not get into the mixture. It is pointed out that since there are no oils present in the lubricant, grinders and reservoirs remain clean and sweet-smelling at all times, and a good surface finish is assured because tool and work are kept cool and clean. Harry Miller Corp.

24—MASTER LINK designed to provide greater safety

Designated the Shaped Section Master Link this device for use with industrial slings is said to hold its form under loads and stress up to 18 per cent greater. It is explained that just as a structural I-beam handles greater loads than a solid beam of the same weight, so does this link give better performance when compared to a link with a round section. Made of Accoloy, a high strength steel alloy, the components of this link are produced in sizes from ½ in. to 1¾ in. They are available as components of company's slings, also separately for use with any make of chain or wire rope sling. American Chain & Cable Co. Inc.

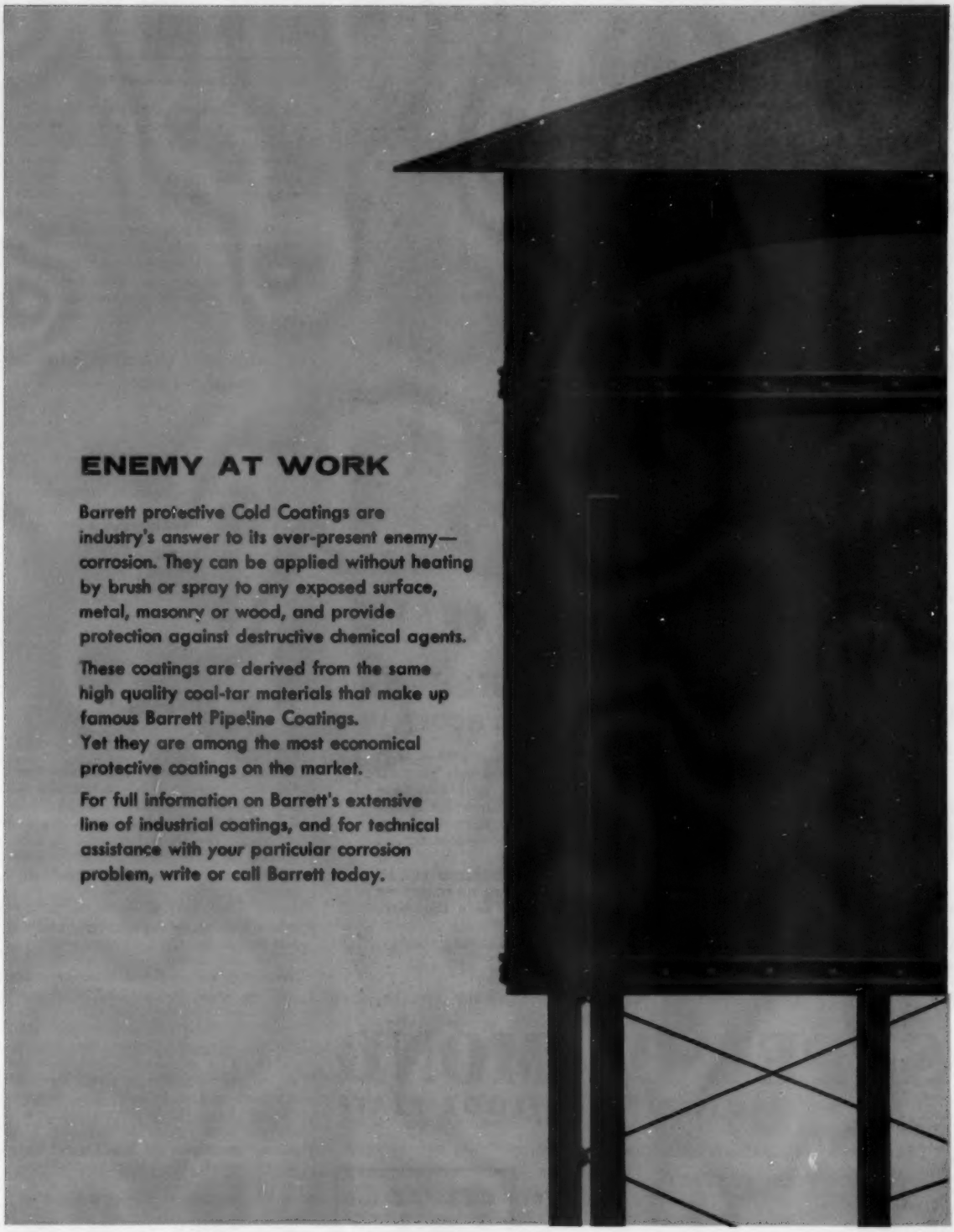
25—RERATED MOTORS for use in hazardous areas

The Type H is a rerated NEMA explosion-proof motor in ratings from 1 to 30 hp, designed for Class I Group D service for areas where inflammable gases and volatile liquids are present. The motor is fully enclosed, non-ventilated, in frames 182 and 184. Frames 213 through 326U are fully enclosed and equipped with sparkproof aluminum fan, cast iron conduit box, cast iron frame. Electro Dynamic Div., General Dynamics Corp.

26—FIBERGLAS BOARD for modular ceiling system

These Fiberglas acoustical ceiling boards for modular ceilings are designed to let the architect fit the ceiling to the building with corollary savings in labor and reduction of waste. The boards are adaptable to modular ceilings due to their inherent characteristics. They are light in weight yet strong enough to support themselves over long spans, it is stated; and they are dimensionally stable and will not buckle, warp or expand.

Company is producing the larger ceiling boards in eight standard sizes ranging from 24 by 24-in. to 48 by 48-in. Use of these sizes avoids design limitations imposed by smaller-size units. Three types of Fiberglas boards are offered for modular ceilings: Stria, with a white grooved ceiling surface; Sonofaced, in which the boards of sound absorbing material are encased in colorful duPont Mylar film



ENEMY AT WORK

Barrett protective Cold Coatings are industry's answer to its ever-present enemy—corrosion. They can be applied without heating by brush or spray to any exposed surface, metal, masonry or wood, and provide protection against destructive chemical agents.

These coatings are derived from the same high quality coal-tar materials that make up famous Barrett Pipeline Coatings. Yet they are among the most economical protective coatings on the market.

For full information on Barrett's extensive line of industrial coatings, and for technical assistance with *your* particular corrosion problem, write or call Barrett today.

CHEMICAL PROGRESS WEEK-APRIL 23-28

Barrett®

INDUSTRIAL COATINGS

BARRETT DIVISION, Allied Chemical & Dye Corporation, 40 Rector Street, New York 6, N. Y. In Canada: The Barrett Company, Ltd., 5551 St. Hubert Street, Montreal, Que.

Allied Chemical

OVER 100 YEARS OF EXPERIENCE

For more facts circle 609 on Reply Card

Cleats reduce slipping on football fields, but–

WALK and WORK SAFELY

on low-cost A.W. SUPER-DIAMOND

ECONOMY ROLLED STEEL FLOOR PLATE

Forty raised steel figures to the step are your assurance of foot safety. Secrets of SUPER-DIAMOND's anti-slip protection for men and rolling equipment are the diamond design and alternate spacing of figures at right angles and correct distances for maximum friction from any angle of approach. After years of usage, the diamond pattern still retains its safe, comfortable footing . . . still permits quick cleaning and draining.

Made from tough steel floor plate, SUPER-DIAMOND can be fabricated with normal shop equipment. There are no matching problems. Use it structurally, as an overlay or as a complete flooring.

No other floor plate can match A.W. SUPER-DIAMOND's *safety, durability and easy maintenance at so low a cost.*

A.W. SUPER-DIAMOND

ROLLED STEEL FLOOR PLATE

"The diamond in the rough . . . a gem of a flooring."

ALAN WOOD STEEL COMPANY

Conshohocken, Pa.

Please send A.W. SUPER-DIAMOND Booklet SD-9

Name_____

Title_____

Company_____

Address_____

City_____ Zone_____ State_____

Other products: A.W. ALGRIP Abrasive Rolled Steel Floor Plate—Plates—Sheets —Strip—(Alloy and Special Grades)

For plants where oil, water and grease raise special problems of slipping accidents, we suggest a check on the special qualities of A.W. ALGRIP . . . the world's only abrasive rolled steel flooring.

For more facts circle 610 on Reply Card

NEW PRODUCTS

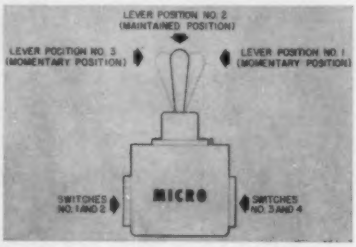
(Begins on page 160)

facings; Textured, with soft white finish.

Conventional lighting systems may be installed with the Fiberglas boards. Waste is declared negligible wtih these boards since they require minimum fitting at columns and edges. Claimed firesafe, odor-proof and rot-proof, the boards are installed by simply resting them on exposed "T" systems, permitting convenient access to electrical equipment and duct-work. Manufacturer says that 75 to 90 per cent of the noise encountered is absorbed by boards. Owens-Corning Fiberglas Corp.

27—TOGGLE SWITCH with a good memory

This toggle switch is a four-pole assembly (21AT1) with one pole for indicating which circuit was last operated. Company says this switch promises to simplify some basic circuit designs of remote control equipment, computer devices, etc. The assembly uses three single-pole double-throw functional basic



switches and one single-pole double-throw "memory" switch. In application, the memory switch indicates, through a pilot light or buzzer, which circuit was last actuated. The three functional switches operate at three lever positions; maintained center and momentary from each extreme position. Two switches are actuated when lever is moved to one extreme position, and the other switch is actuated in the other extreme position.

The basic switch used for the electrical memory is actuated (maintained) in one extreme lever position and is released (maintained) in the other extreme position. The lever returning to the center position does not affect the memory switch, it is explained, which indicates the extreme position in which the lever is or was in most recently. The switch is designed to provide positive actuation and prevent false signals or operation from partial movement of the toggle lever. Micro Switch, Div., Minneapolis-Honeywell Regulator Co.

28—POWDER NOZZLE permits straight cuts in concrete

With this powder nozzle it is claimed possible to cut concrete with a standard industrial powder-cutting blowpipe. Using the nozzle, clean, straight cuts can be made in concrete, it is announced, on both vertical and horizontal planes. In

Change motors in minutes—

with FALK *all-steel* MOTOREDUCERS

No long and costly "down time" involved

Motors can be interchanged or replaced *in minutes* with the all-steel, All-Motor type FALK Motoreducer. No long and costly "down time" is involved in making the change!

Best of all, replacement is not limited to original make of motor—new NEMA frames may be substituted for old. This versatile Motoreducer operates with any make, speed or type of standard foot-mounted motor within its AGMA rating. No modification, no special shaft, no "partial" motor required.

In addition to unmatched motor interchangeability, this dependable gear drive—the "work horse of industry"—offers: widest choice of output-shaft position (horizontal, vertical, right-angle)...any output-shaft connection...any mounting, including wall and ceiling...standard speed range from 1.5 rpm to 1430 rpm. All these advantages, plus proved efficiency, low maintenance and extra-long life, make the All-Motor type FALK Motoreducer your best buy for any job requirement.

Furnished in sizes up to 75 hp with any make, style or type of motor; or, *without a motor if desired.* FALK Motoreducers are available from convenient factory, field or distributor stocks, from coast to coast.

Write for Bulletin 3100

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- Single Helical Gears
- Herringbone Gears
- Marine Drives
- Steel Castings
- Weldments
- Contract Machining

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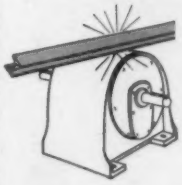
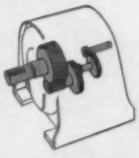
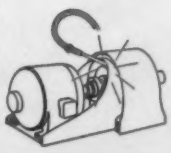


ALL-STEEL HOUSINGS
Rugged, strong, rigid ...all parts heavy steel plate, formed and welded in the Falk Weld Shop.

LARGE OVERHUNG LOAD CAPACITY
Large shafts, oversize bearings...rigid mountings with wide bearing spans to handle maximum loads.

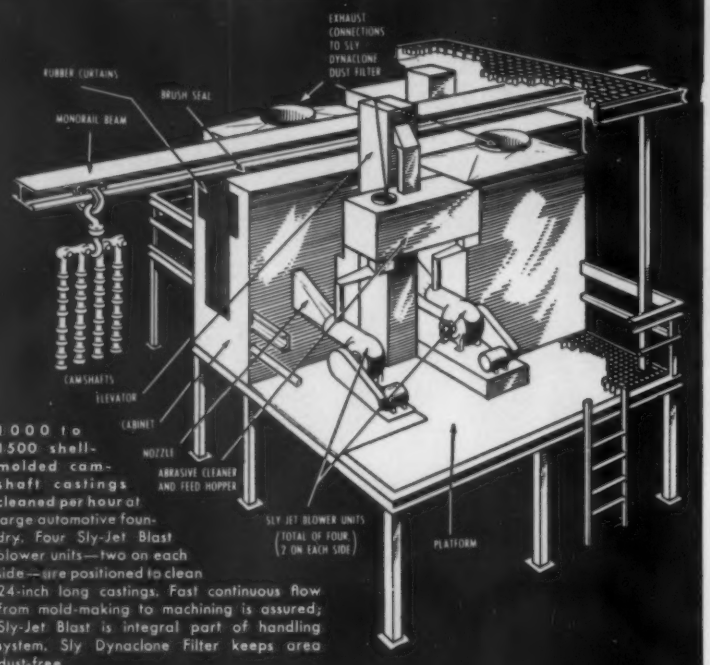


PRECISION GEARING
Heat-treated alloy steel gearing, precision cut and shaved after heat treatment to eliminate distortion.



SEALED HOUSINGS
Splashproof, dustproof, oiltight. Dual closures and one-way vents keep oil in, dust and moisture out.

NEW LOW-COST WAY TO CLEAN SHELL-MOLDED CASTINGS



1,000 to 1,500 shell-molded camshaft castings cleaned per hour at large automotive foundry. Four Sly-Jet Blast blower units—two on each side—are positioned to clean 24-inch long castings. Fast continuous flow from mold-making to machining is assured; Sly-Jet Blast is integral part of handling system. Sly Dynaclone Filter keeps area dust-free.

NEW SLY-JET BLAST

Eliminates need for air compressor . . .
Eliminates maintenance costs of airless wheels

Now, clean shell-molded castings faster, at lower cost. With new, *low-velocity* Sly-Jet Blast, cleaning action is thorough yet "gentle"— therefore, no pitting, no removal of parent metal, no warping or distortion as with other cleaning methods. *Efficient*—abrasive is accurately directed over a large work area through a stationary nozzle, which can be set at any angle from horizontal to vertical. *Economical operation*—blower unit is powered by electric motor; there is no compressor, no need for high horsepower. *Long, trouble-free operation*—there are no moving parts in the blast zone; abrasive is introduced directly into the nozzle. *Versatile*—nozzle opening can be in any shape from circular to rectangular and any size. Abrasive can be any grade of sand, most grades of grit. *Non-stop operation*—cleaning mechanisms can run continuously for effective integration in continuous-flow handling systems.

Take the problem and expense out of cleaning shell-molded castings. Write today for the facts on new Sly-Jet Blast.

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NEW PRODUCTS

(Begins on page 160)

powder-cutting, a metallic powder is added to the oxy-acetylene cutting flame. This increases the flame temperature which, in turn, increases speed and range of cutting action. The powdered metal is injected into the flame automatically from a powder dispensing unit. Equipped with this powder nozzle, a power-cutting blowpipe will cut cement, concrete, and reinforced concrete, says company. Cutting speeds vary according to thickness of material. Linde Air Products Co.

29—TILE CLEANER makes maintenance job easier

My-Ko Tile Cleaner was developed to facilitate removal of excess adhesive, usually a problem after tile floors have been installed. However, says company, it was found that this cleaner not only removed ahesive, but also did a thorough job of removing paint, rubber heel marks, and other stains from vinyl and asphalt floors. For this reason it is being offered as a regular floor cleaner. To use My-Ko Tile Cleaner, you simply spread it on, then rub in gently to remove dirt or stains. According to manufacturer, this product is safe to use, can't harm surface or color and eliminates need for use of steel wool and solvents. It costs about $1.25 for a pint. My-Ko Chemical Corp.

Use the Reader Service Cards provided on pages 225-226 to ask for more information on these products. Circle item numbers of products in which you are interested.

30—SWITCHGEAR DESIGN has safety design features

This manufacturer's low-voltage draw-out switchgear now accommodates the 4000-amp Type KE circuit breaker in a 36-in. wide compartment, providing small space requirements for breakers with interrupting ratings of 150,000 amp at 240 v, and 100,000 amp at 480-600 v. As with other Type "K" circuit breakers, the switchgear mounting allows the breaker to be in its test position with the compartment door closed, giving increased safety and added dust protection. Full information is covered in Bulletin —6004B. I-T-E Circuit Breaker Co.

31—TIMER VALVES control flow automatically

Flow of liquids, gas, or air can be controlled automatically with these timer valves, company reports. They consist of a solenoid valve and timer control sealed in a water-tight case. The valves turn the flow on or off at desired time intervals. They are available in a wide variety of timing cycles, company points

Now, *quality high-voltage cable at less cost:* *with* **new RoZone-RoSeal**

Superior moisture resistance compared to other types of nonmetallic sheaths: That's just one advantage of RoSeal, Rome Cable's new special thermoplastic sheath for shielded power cable rated up to 15 KV.

In its new RoSeal, Rome has perfected a sheathing material which better fulfills all requirements for a shielded power cable sheath, eliminates many disadvantages of other sheathing materials, *and* reduces cable cost.

In the case of RoZone-RoSeal cable, the new RoSeal sheath is applied over Rome's premium quality oil-base type insulation, RoZone. Thus, the new RoSeal sheath, combined with time-proven RoZone insulation, offers seven other advantages, in addition to its outstanding moisture resistance.

1. The coefficient of friction of RoSeal is considerably lower than other sheathing materials. This makes it much easier to pull in ducts or conduit.
2. RoSeal is easier to bend and install at subzero temperatures. Minimum recommended installation temperature is −40°C.
3. RoSeal has proved satisfactory for *both* underground and overhead use.
4. RoSeal is durable and long lasting —has a life expectancy at least equivalent to polychloroprene sheath.
5. RoSeal is flame resisting.
6. RoSeal provides a rugged mechanical barrier. Its tensile strength, hardness and other mechanical properties are designed for the job.
7. RoSeal is resistant to microorganism attack. Its resistance to weathering and soil conditions is also equal to that of polychloroprene sheaths.

Electrical tests made in the Rome laboratories show uniformly higher corona level and dielectric strength for RoSeal jacketed power cables.

RoSeal has particularly high resistance to oils and most chemicals, making it especially adaptable for installation in chemical plants, refineries, paper mills, steel mills and the like.

We invite you to prove for yourself the value of RoSeal. Write today for a sample of RoZone-insulated, RoSeal-sheathed power cable. You'll find it's everything we have stated here.

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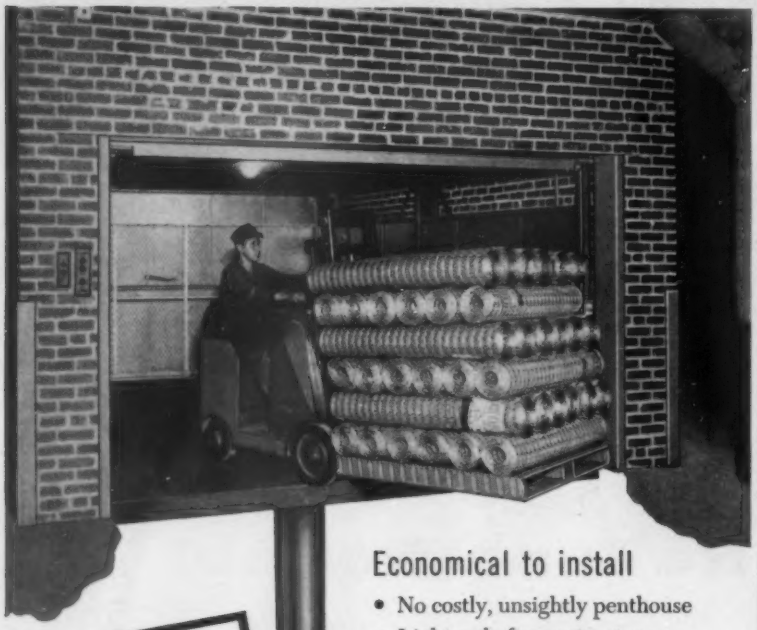

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Economical to install

- No costly, unsightly penthouse
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Efficient, dependable operation

- Reduced maintenance costs
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NEW PRODUCTS

(Begins on page 160)

out, and have many applications. For example, they can be used to turn a flow either on or off, or both on and then off, at any desired time. They can perform this function each day with repeat cycle operation—no re-setting is needed. Valves can be used to obtain continuously intermittent operation—that is, they can be set to open and close a valve a certain number of times per minute, hour, day. They fit standard pipe ⅜ in. and larger, and operate on 110 or 220-v 60 cycle current. Automatic Controls Corp.

32—EPOXY COMPOUND simplifies cable splicing

Thoxene Clamp-Coat is a hard-setting plastic compound developed for rapid field insulation and weatherproofing of electrical cable splices. The material is also used as a sealant for gas lines. Packaged in a compartmentalized polyethylene container, the compound is ready to use as soon as its two components are mixed. By covering the splice with the activated

formulation and letting it harden (setting time is 2½ to 3 hr) a weatherproof, abrasion-resistant coating with high electrical insulation is achieved, says manufacturer.

The mixture contains no solvent, and coatings up to ⅛-in. thick can be applied without dripping off. This compound's high resistance to moisture, abrasion and impact, and adhesion to wires, are attributed to use of company's Epon resins in the formulation. These epoxy resins are also said to help attain unusual electrical and mechanical properties. To use the material, you remove the metal clips separating the base formulation and activator in the plastic package; then stir with the applicator provided. One component is blue, the other, yellow; complete mixture is indicated when a uniform green is obtained. Shell Chemical Corp.

33—FACE SHIELD for all purpose protection

The 770 Face Shield comes in three window lengths of 4, 6 and 8 in. measured from top to bottom. Windows mount inside an aluminum channel in a tight assembly to keep out dirt or liquid. A feature announced is the complete flexibility of the entire headband. It is as

Higher Efficiency ... Greater Safety

Lower Material Handling Costs

with

JalFlex Slings

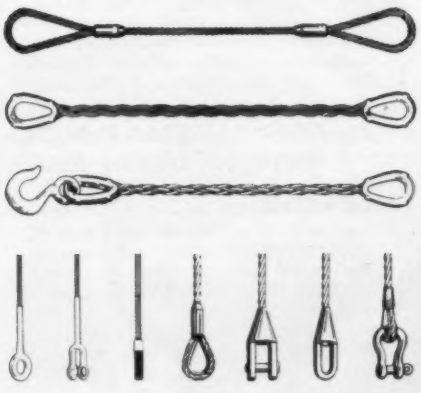
If you want wire rope slings that have the greatest flexibility, high strength and long, safe service life, J&L offers you braided slings of outstanding workmanship combined with the particular design best suited to your job.

There's a JalFlex sling for every handling job from 55-gallon drums to diesel locomotives. Their quality is the result of J&L know-how in the production of steel, steel wire, and wire rope. Every unit in J&L's complete line is designed and proved to give you the safest, most economical material handling.

Find out about JalFlex slings today. Get a copy of the new JalFlex sling catalog. It gives easy-to-use information on J&L slings and fittings, including a J&L exclusive, JalKlamp, the special alloy sleeve that produces a splice as strong as the rope itself.

Designs for Every Need

JalFlex Slings and Fittings



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DYNAPRENE®

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gives LONGER LIFE BETTER SERVICE

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DYNAPRENE is made by experienced wire makers from the finest quality raw materials, checked against Whitney Blake's exceptionally high standards.

BECAUSE

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The special neoprene jacket compound created for DYNAPRENE is particularly resistant to abrasion as well as sunshine, ozone, humidity, acid fumes and aging.

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DYNAPRENE is a premium flexible cord sold through electrical suppliers at a reasonable price.

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WHITNEY BLAKE CO.

NEW HAVEN 14, CONNECTICUT

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NEW PRODUCTS

(Begins on page 160)

flexible as elastic type bands, says manufacturer, but much longer-lived. The headband of vinyl plastic is adjusted by a sliding strap—there is no metal or mechanical adjustment. The shield is designed to conform to the head at all points. Windows are of cellulose-acetate, in either green or clear. Chicago Eye Shield Co.

34—COATING is transparent, can be stripped off

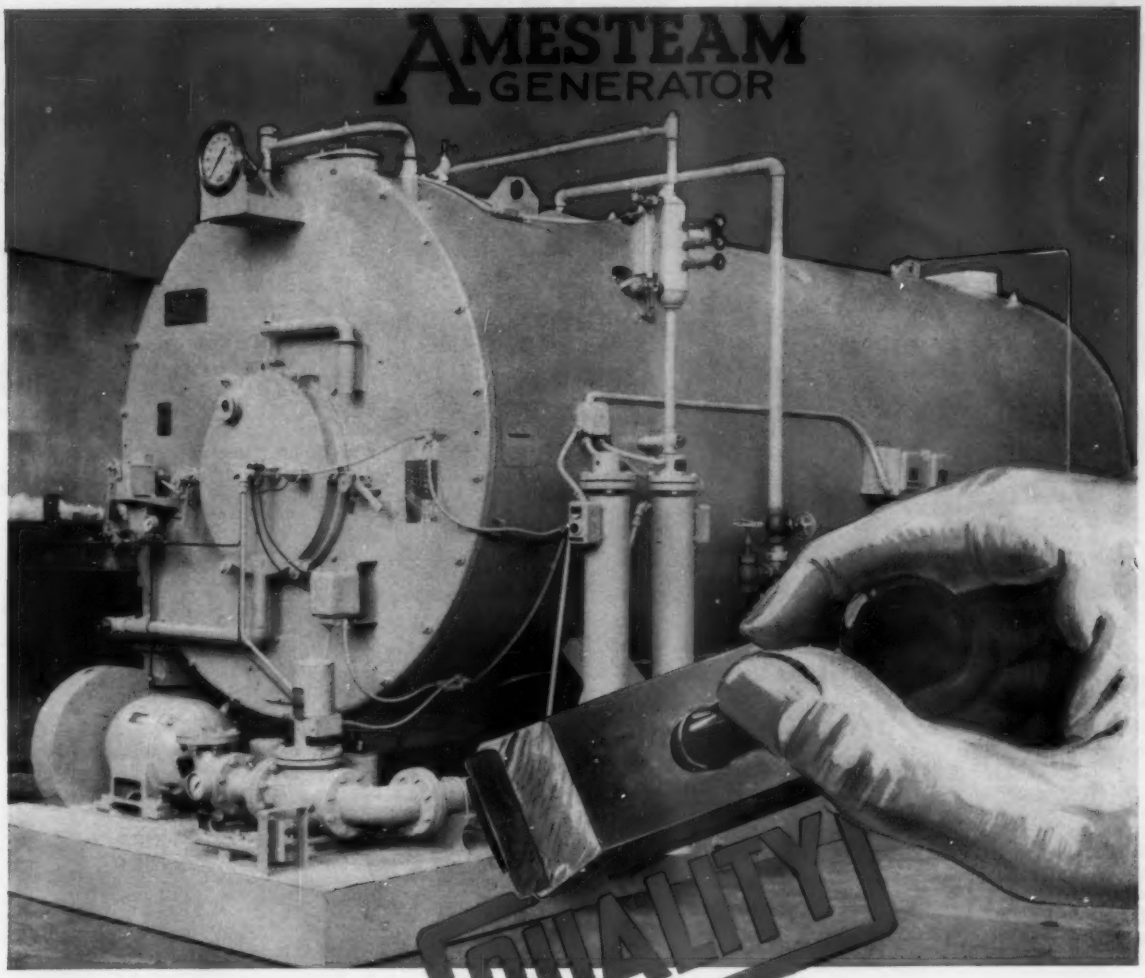
Seal Strip comes in two types, CC 100 Clear and AM 200 Amber, at a lower cost. It is reported to provide effective protection for tools and metal parts against corrosion, chipping, all types of handling, heat, cold and humidity. Seal Strip comes in block form and must be melted down in a tank at a controlled temperature of 325 F. The coating is applied by dipping directly into the tank of melted Seal Strip. The film dries in from 2 to 5 sec and leaves a thin tough resilient protective coating. It can be removed like peeling a banana. Seal Strip is also economical, company points out; it can be remelted and used over and over again if not contaminated or overheated. It can be used as a mask coat, protective coat, storage and mothballing. Seal Strip Corp.

35—HYDRAULIC PUMPS for heavy duty applications

The 3600 Series of 150-hp, 1500 psi hydraulic pumps, designed for heavy mobile and industrial equipment, are engineered for installations where space is limited and where adverse conditions exist. Pumps will deliver 65-90-110 gpm at 1200 rpm, depending on the model. Speeds range to 2000 rpm; pressures to 1500 psi and fluid horsepower to 150 hp. Companion control valves have also been designed for the series. The high capacity permits consideration of hydraulic operation and control for larger stationary and mobile equipment previously driven by mechanical and other methods. Hydreco Div., The New York Air Brake Co.

36—HEAT RESISTANT BRICK for rugged foundry floors

Emeri-Brick is announced as a versatile heat-resistant brick that withstands heat and thermal shock. Its use is reported to offer foundries and other primary metal plants an economical answer to specialized flooring problems. Emeri-Brick provides a speedy means of placing a heavy-duty floor, says company; floor areas can be put back in service sooner than with concrete, especially if scarification is required. Another advantage cited is long service life. Emeri-Brick measures 7.75 in. by 2.22 in. by 3.55 in. It is usually placed on end for maximum protection against effects of heat and thermal shock, for example, in



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. . . and isn't low-cost steam what you're actually after in a boiler? There's only one way to get it — with a boiler of proven high quality.

Ames Iron Works has been building such boilers for 108 years, putting into them the engineering, material and workmanship necessary to give the best possible service to the customer.

Today's AMESTEAM GENERATOR, with its simple, efficient, 3-pass design, embodies the best of those 108 years — the latest developments which we know are practical. And the number of customers ordering their 2nd, 3rd, 4th, 5th and more AMESTEAM GENERATORS justifies the painstaking care that goes into these units.

For a quality boiler that's bound to give you overall steam economy — plus the well-known AMES 24-hour service — specify AMESTEAM GENERATOR — 20 sizes, 10 to 600 h. p. 15 to 200# Oil, Gas or Oil-Gas Combination . . . *Mail coupon today.*

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Gentlemen:
Please send me further information on AMESTEAM GENERATORS and name of the nearest representative.

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COMPANY.....

ADDRESS.....

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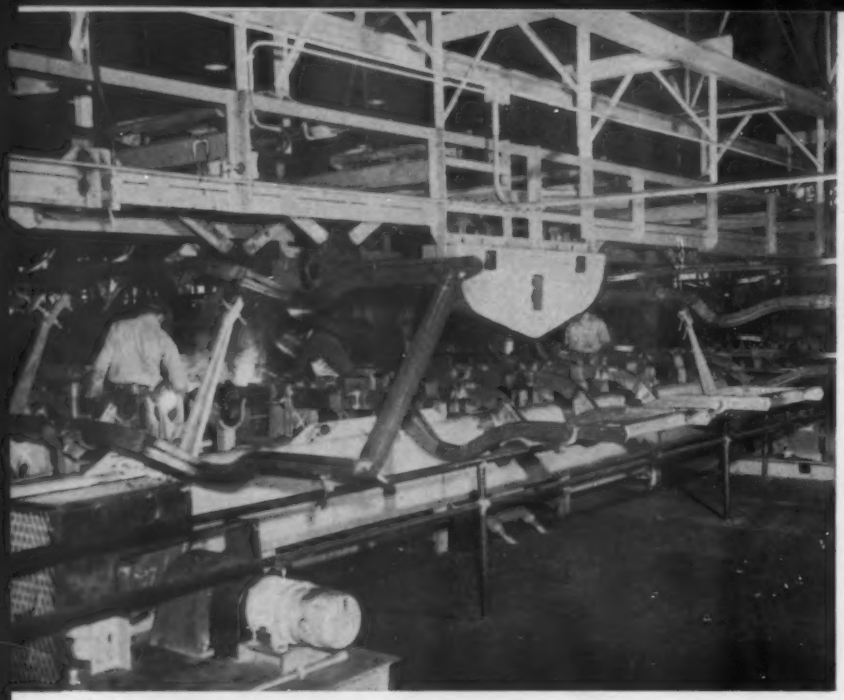

New Handling System

increases production while eliminating two lines

In one of the automotive industry's newest plants, production of frames for 1955 models was lagging, even though 6 lines were being used. Then Planet engineers were consulted.

They designed and installed a new frame handling system which exceeds current production requirements, doubling the output of the old-style line. *Now only 4 lines are used.* In addition, quality has been improved.

Here's how the system operates. The component parts of the frame are delivered by trolley conveyor to a frame assembly conveyor where they are automatically positioned for tack welding. The assembled frame is then discharged on to the frame welding conveyor illustrated above.

Here the frames are automatically rotated, 90° at a time so that all finished welding is done on a horizontal plane as the frames move by each welding station. Frames are then automatically conveyed through checking, cleaning, and painting operations.

If you have a production problem, why not consult Planet Corporation engineers? Write or phone today. There is no obligation.

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1840 SUNSET AVENUE
LANSING, MICHIGAN

- CONVEYORS
- ENGINEERED SYSTEMS
- FOUNDRY EQUIPMENT
- AUTOMATION
- STEEL FABRICATION

"IT PAYS TO PLAN WITH PLANET"

NEW PRODUCTS

(Begins on page 160)

ladle rests. It is placed on edge in front of pouring cupolas, in cooling and storage areas, and is placed flat in less critical heat areas where applied temperatures range from 800 to 1200 F.

In putting down a floor of Emeri-Brick, an underlayment or leveler bed of clean, sharp sand and Portland cement is applied to the base concrete. Three parts of sand and one of Portland cement are machine-mixed, and the dry mix dampened to hydrate the cement and make the mix tampable. This mixture is spread on the base concrete to give a minimum of 1½ in. depth after compaction with roller and tamp. Emeri-Bricks are then laid on. Finishing is accomplished by grouting with a thin watery mixture of Portland cement and water. After grouting, traffic is kept off the area 24 to 36 hr. Walter Maguire Co., Inc.

37—GEARED JOINT transmits torque at 45 to 315 deg

Actually an adjustable gear box that transmits torque at any angle from 45 to 315 deg, this new geared joint has needle bearings which have increased its efficiency 60 per cent, says manufacturer. The new design is also lighter and smaller

than company's previous models having the same torque capacity. This makes the unit lower in cost. Primary use for the geared joint, at present, is for making sharp bends in valve remote control linkages using flexible shafting or reach rods. To install the unit, you merely connect each end to flexible shafts or reach rods, bracket the joint in place, and then drill a spot for a set screw to keep the two halves of the joint at the proper angle. With the needle bearings the geared joint can be used for power applications with speeds to 500 rpm. Three sizes—Models 40, 60 and 250—are offered; the largest has a maximum recommended operating torque of 3500 lb-in. Stow Mfg. Co.

38—TIMING MOTORS keep rate independent

Reported to provide the accuracy of an escapement clock and the power of an electric motor, these chronometrically governed d-c timing motors are de-

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Industrial Uses Widened by *New Features* of GPL *ii-TV*®

Many additional industries are benefited, many established industrial applications made easier, by new closed-circuit equipment which has been added to the GPL *ii-TV** System.

Have you a task that can be simplified by the instantaneous transmission of visual data? Like monitoring an assembly line or a remote machine? Controlling a complicated or dangerous process? Surveillance? Sales training? Stockholder relations? GPL *ii-TV* can help you solve these and hundreds of other business and industrial "seeing" problems.

The new GPL *ii-TV* equipment incorporates the same skilled design, the same top quality material and construction, for which all GPL television equipment is noted. When you use GPL *ii-TV* you are assured of outstanding picture quality, ease of operation and minimum upkeep. Moderate initial cost is often quickly offset by savings the equipment makes for you.

*The *industrial-institutional TV* System manufactured by General Precision Laboratory.

Basic *ii-TV* Camera—smaller than a football, weighs only 5 lbs. Shaped to fit into tight places. No special lighting needed; sensitive Vidicon tube picks up quality pictures at low light levels. Plugs into any AC wall outlet.

GPL *ii-TV* Camera mounted for remote-control, *indoor* use. Changes in direction—horizontal and vertical—adjustment of lens opening and focus can all be made from remote location. Full 360° camera viewing, 90° tilt.

GPL *ii-TV* Camera for remote-control, *outdoor* use. Weatherproof and explosion proof housings; full 360° camera viewing, 90° tilt.

GPL *ii-TV* Control Unit. 26 lbs. including case. Easily carried by one person. Wall or rack-mounted for permanent installation. Can be located remote from camera.

GPL *ii-TV* Switching Unit. Provides push-button selection for viewing the reports of four cameras, using only one camera control unit. With sequencing equipment, automatic remote surveillance of an entire production line or every step in control of a process is possible.

GPL Monitors or ordinary home TV receivers can be used. Circuit can include any number of receivers. Coaxial lines, easy to install, provide unlimited closed-circuit distribution.

GPL TV Projector. Multiplies the usefulness of a closed-circuit TV system by throwing bright, clear, movie-size pictures on a wall screen. Enables several hundred people to watch together.

Find out how GPL *ii-TV*'s built-in superior features can help you. Write:

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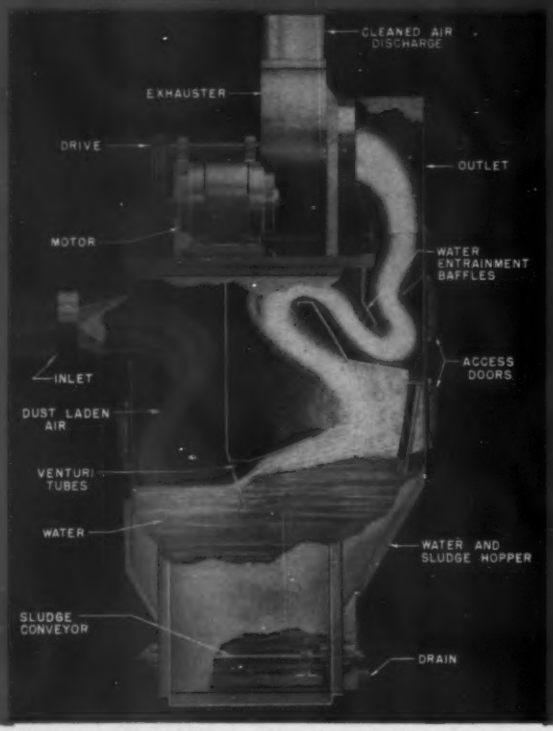
NEW PANGBORN VENTRIJET
Gives Efficient Wet Dust Control



Efficient wet dust collection depends on breaking water into particles and mixing it with the dust. The new Pangborn VENTRIJET Collector utilizes venturi tubes to achieve this effect. As dust-laden air enters the inlet chamber, heavier dust particles sink to the bottom. The air stream then passes through the venturi tubes at high velocity, drawing water with it and breaking it into minute particles. These particles mix thoroughly with the remaining dust in the air and give the VENTRIJET its high operating efficiency. In the outlet chamber, the resulting sludge settles to the bottom for removal. Eliminator sections remove water droplets in the washed air and the cleaned air is then discharged. The result is peak performance in a minimum of space.

Pangborn VENTRIJET offers these advantages:

- Complete, self-contained unit with low headroom, minimum floor space
- High air velocity through venturi tubes insures thorough mixing of air and water
- Venturi tube design results in minimum pressure loss and provides uniform flow—no narrow channels to become choked with sludge
- Tube design and thorough washing action enable collector to handle heavy loads.

For full details, write to PANGBORN CORPORATION, 3200 Pangborn Blvd., Hagerstown, Maryland.

Visit "Pangborn Institute" at AFS Show, Atlantic City, May 3—9

Pangborn CONTROLS DUST

For more facts circle 620 on Reply Card

NEW PRODUCTS

(Begins on page 160)

signed to keep rate independent of load, line and temperature variations. Power pulses at full line voltage are applied to a small motor at intervals controlled by a jewelled escapement, with pulse duration determined by travel of motor. This method is designed to hold motor travel constant during each time interval regardless of load (within rating). As a result beat rate is held constant within ±0.1 per cent for line voltage variations of ±20 per cent and load variations from zero to full load. Standard escapements are 300-beat and 900-beat types giving 150 or 450 complete oscillations per minute. Motors are supplied in conventional form with self-contained gear reduction and output shaft. Weight is 7.5 oz. The A. W. Haydon Co.

39—FLOOR DRESSING is self-polishing product

Poly-Glo is announced as providing three major floor maintenance benefits: ease of application; slip resistance (UL listed); beauty without buffing. It contains no wax or solvents, says manufacturer; it dries in minutes to a hard, glossy, transparent film that will not yellow or discolor even the lightest floors; it resists heel marking, dirt and water and will not dust. Poly-Glo is suggested for asphalt, rubber, linoleum, vinyl, sealed wood, terrazzo, concrete, and all other resilient and non-resilient floors. It may be applied with string mops or lamb's wool applicators; comes in 5, 30, and 55-gal containers. Masury-Young Co.

40—SURFACE ACTIVE AGENT improves processing jobs

Isomal 265 is an anionic surface active agent for use in industrial processes as a wetting agent, rewetting agent, penetrant, detergent and emulsifier. It is formulated to reduce processing time, increase processing efficiency and improve finished products. The new fluid is a concentrated sulfonated ester type liquid, said to be unusually versatile and efficient. It can be used to remove grease, oil and moisture from all types of metal surfaces, says company, and in fact, it can serve as a cleaning agent for all types of polishing, cleaning and buffing. And it can be used in the manufacture of cleaning compounds. In dilute solution, Isomal can be employed to detect pin holes or defective areas in tanks, pipes and hydraulic systems without using organic solvents.

It is claimed to have a broader range of solubility in water and nearly all organic solvents than possible with other surface active agents. It is easily dispersed in alcohol, acetone, petroleum solvents, oils and chlorinated solvents. Clear in appearance, Isomal 265 has a neutral pH factor and a specific gravity of 1.088 at 60 F. It is approximately 65 per cent active and mildly pleasant in odor. High

THE SAME PROBLEM

KEPT THEM BOTH WORKING LATE!

The production chief wonders how to get more output from his machines. The oiler wonders how to keep them *running*. Both know that vital time is lost when machines must be stopped for lubrication during the day. And yet, without proper lubrication, the threat of breakdown grows. Perhaps if the oiler and his chief pooled their knowledge, they might discover a simple solution to their problems.

Yes, back of lost man-hours, machine downtime, and product spoilage frequently lies the real trouble-maker, old-fashioned lubrication methods. If *you* are looking for ways to increase production and decrease costs, you may find an answer in improved lubrication.

Modern Automatic Alemite Lubrication. A Mid-west manufacturer cut costs $20,000 a year. A paper company saved $3,000 a month. And a textile firm ended substantial production wastes.

The answer: Modern Alemite systems that automatically feed exactly the right amount of oil or grease to every lubrication point . . . that keep machines running longer with less downtime . . . that eliminate oil waste and product spoilage.

Take a look around your shop. Ask yourself if an Alemite lubrication expert might not recommend an inexpensive solution to your lubrication problems. Wherever you are, there is an Alemite representative ready to serve you.

ALEMITE

REG. U. S. PAT. OFF.

38 Years of Lubrication Progress

A PRODUCT OF SW STEWART-WARNER

FREE! NEW BOOKLET!

Alemite Div. of Stewart-Warner, Dept. G-46
1850 Diversey Parkway, Chicago 14, Illinois

Gentlemen: Please send me my free copy of "An Executive's Approach to Lubrication Problems." No obligation, of course.

Name.....

Company.....

Address.....

City.....Zone.....State.....

For more facts circle 621 on Reply Card

SAFE HANDLING REQUIRED

When white-hot molten steel is poured, only the finest quality products are specified to insure absolute safety. The wire rope lines that control movement of the ladle above are secured with genuine Crosby Clips. Easily recognized by the famous Red-U-Bolt, genuine Crosby Clips are drop-forged and hot-dip-galvanized for maximum wearing ability. The safest clip sold, genuine Crosby Clips are specified for safety in more plants than any other drop-forged rope fasteners. A complete range of sizes ⅛″ to 3″.

STRONG AS 3B CHAIN

Added safety is given to men and equipment using repaired steel chains with genuine Laughlin "Missing Links". As strong as 3B chain, Laughlin "Missing Links" are drop-forged from special forging steel, heat-treated, and matched under pressure for a perfect fit. Available in a complete range of sizes ⅜″ to 1⅞″ at distributors everywhere.

HANDLES 4 CHAIN SIZES

Four different clevis hook sizes can be interchanged instantly on Laughlin's new Load Binder—industry's safest and strongest. Laughlin's Load Binder with 20-inch handle takes Laughlin Clevis hook sizes ¼″, 5/16″, ⅜″ and 7/16″. The 22-inch Load Binder takes ⅜″, 7/16″, ½″ and ⅝″ sizes. Extremely strong, Laughlin Load Binders won't spread even under heavy strain because the swivel tongue swings *within* the handle-end slot, and the clevis is on the trunnion.

PERFECTLY ALIGNED

Safer performance and far greater strength are obtained with Laughlin shackles because the pin holes are drilled—assuring perfect alignment. Made of special forging steel throughout, the pins are heavier and stronger than the shackle itself to prevent shearing due to shifting or shock loads. Weldless and drop-forged, famous Laughlin "Perfectly Aligned" shackles are available in a complete range of sizes from 3/16″ to 3″ at distributors everywhere. For free catalogs on the complete Laughlin and Crosby lines, write the Thomas Laughlin Division, Portland, Maine, or the Crosby Division, American Hoist & Derrick Co., St. Paul 1, Minnesota.

For more facts circle 622 on Reply Card

NEW PRODUCTS

(Begins on page 160)

operating efficiency is attributed to its balance of lipophilic and hydrophilic elements. The solution is compatible with both non-ionic and other anionic agents, is stable at temperatures to 210 F, and has no upper or lower cloud point. The Johnson-March Corp.

41—ABRASIVE BLADE is faster, safer, break-resistant

With the new Tuffie Blade, every masonry can be cut—hard, medium, soft—with the efficiency of regular blades, it is announced, but with increased safety due to special reinforcing. Reinforced throughout with tough fiber glass, the Tuffie has three-ply reinforcing around hub on both sides for two-way protection when cutting. The Tuffie features friction-free sides which add hundreds of cutting edges to each blade, it is explained, and both sides of blades are covered with raised cutting edges. These extra cutting edges cut faster, cleaner, eliminating drag, company notes—with all the power right in the cut. Tuffie is available in 12, 14, and 18 in. diam. Eveready BrikSaw Co.

To receive product data circle item numbers on the handy Reader Service Cards provided on pages 225-226.

42—100 F TEMP INDICATOR available in pellet form

Up to now, the lowest temperature rating for which this company's temperature indicating products were available was 113 F—because of summertime storage and shipping problems. Now a 100 F pellet is offered for use in testing effectiveness of insulations, regulating heating and cooling systems, and production line work where 100 F is prescribed operating temperature. Shipment of these low temperature pellets is limited to off-summer months, it is pointed out, and if stored during hot weather, they must be kept under refrigeration. Tempil Corp.

43—OSCILLOGRAPH has versatility, easy access

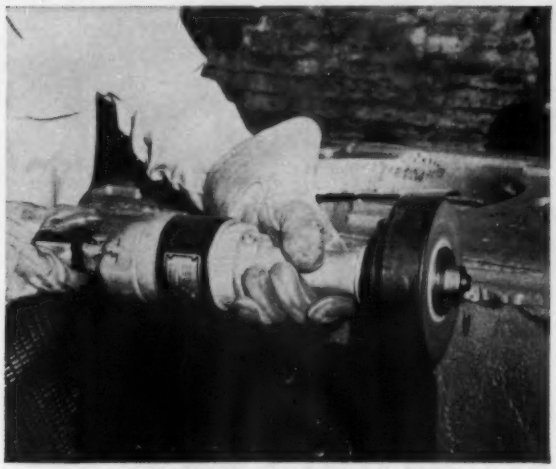
One of the major reasons for the greater versatility of a new oscillograph, designated the PM-21, is the accommodation for 1 to 22 bifilar-type and four zero-trace galvanometers. In addition, one bank of bifilar galvanometers (11) can be replaced with as many as 60 wound-coil galvanometers for recording on-off operations. Also, the instrument engineers pointed out, the equipment can be converted easily to a portable, general-purpose oscillograph with paper speeds up to 500 fpm for use in stage testing.

Another major feature of the PM-21 is the easy-access design, which permits

Gardner-Denver . . . Serving the World's Basic Industries

DOWN SHE GOES. Powerful G-D sheeting driver gets the job done—fast.

BREAK IT UP. That's an order for this G-D team—paving breaker and portable.



GRINDING OUT THE WORK. It's a cinch with a husky Keller Tool air grinder.

DRILLING THE HOLE. Nothing to it with a G-D utility drill and air compressor.

You repair the job . . . not the tool when you choose Gardner-Denver

Many of the world's industries rely on Gardner-Denver air tools for plant maintenance work where time and cost are important factors.

Write for descriptive literature.

Other Gardner-Denver maintenance tools:

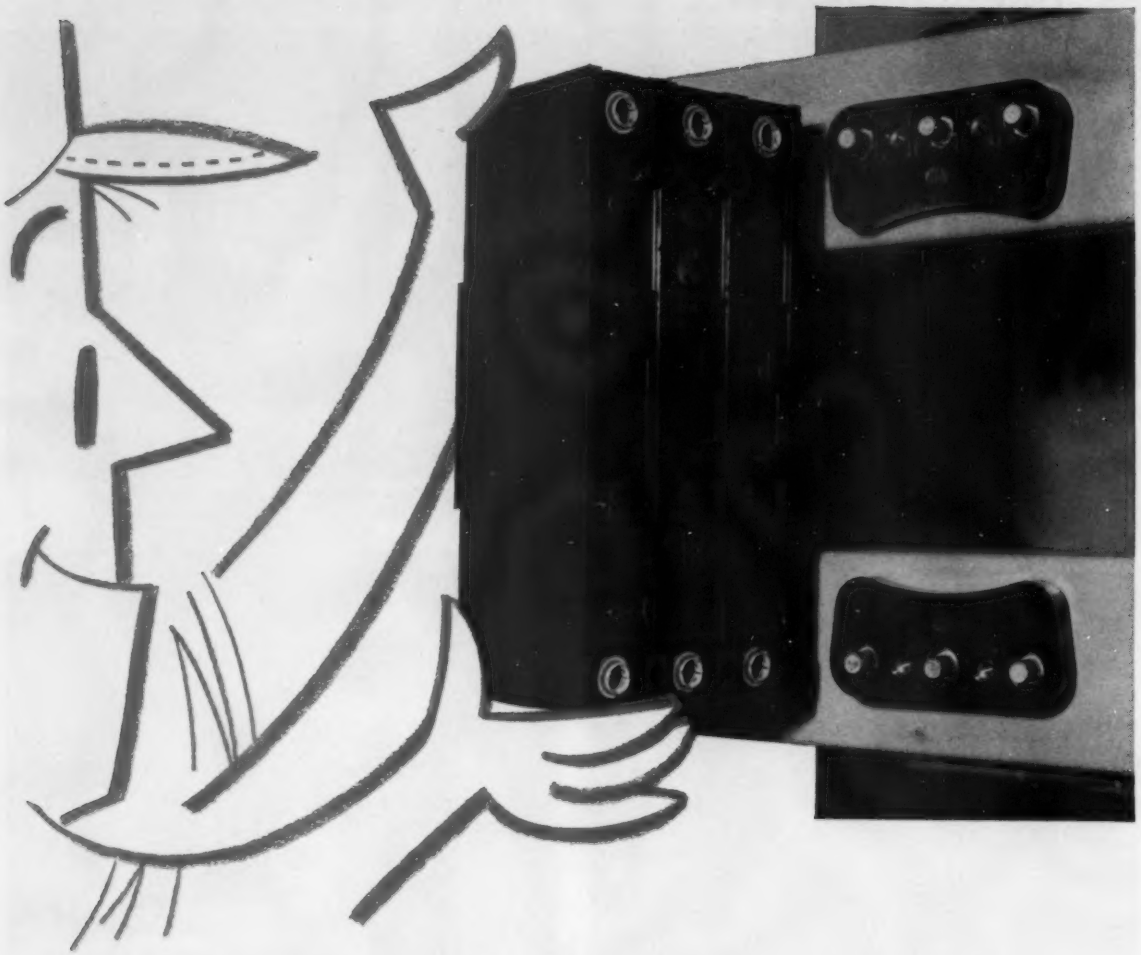
Tampers	Air Hoists
Trench Diggers	Impact Wrenches
Clay Spaders	Sanders and Chippers
Sump Pumps	Air Line Lubricators

GARDNER-DENVER

THE QUALITY LEADER IN COMPRESSORS, PUMPS, ROCK DRILLS AND AIR TOOLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario

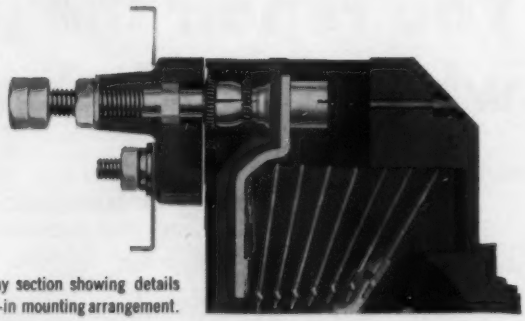
For more facts circle 623 on Reply Card



Ordering Switchboards? Specify Plug-In Mounting of Molded Case Circuit Breakers

Consider the advantages of I-T-E Plug-In Mounting. The added safety of concealed breaker terminals with no live parts exposed. The flexibility of changing breaker ratings within a frame size. The ease of installation and removal. When you do, you'll specify switchboards with this time-proved method of installing molded case circuit breakers—used for many years in maritime switchgear and approved by Underwriters Laboratories Inc.

I-T-E plug-in molded case circuit breakers are available in ratings from 15 to 600 amp, up to 600 volts a-c, 250 volts d-c. Contact your I-T-E representative or leading independent switchboard manufacturers for details. Or write Small Air Circuit Breaker Division, I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Phila. 30, Pa.



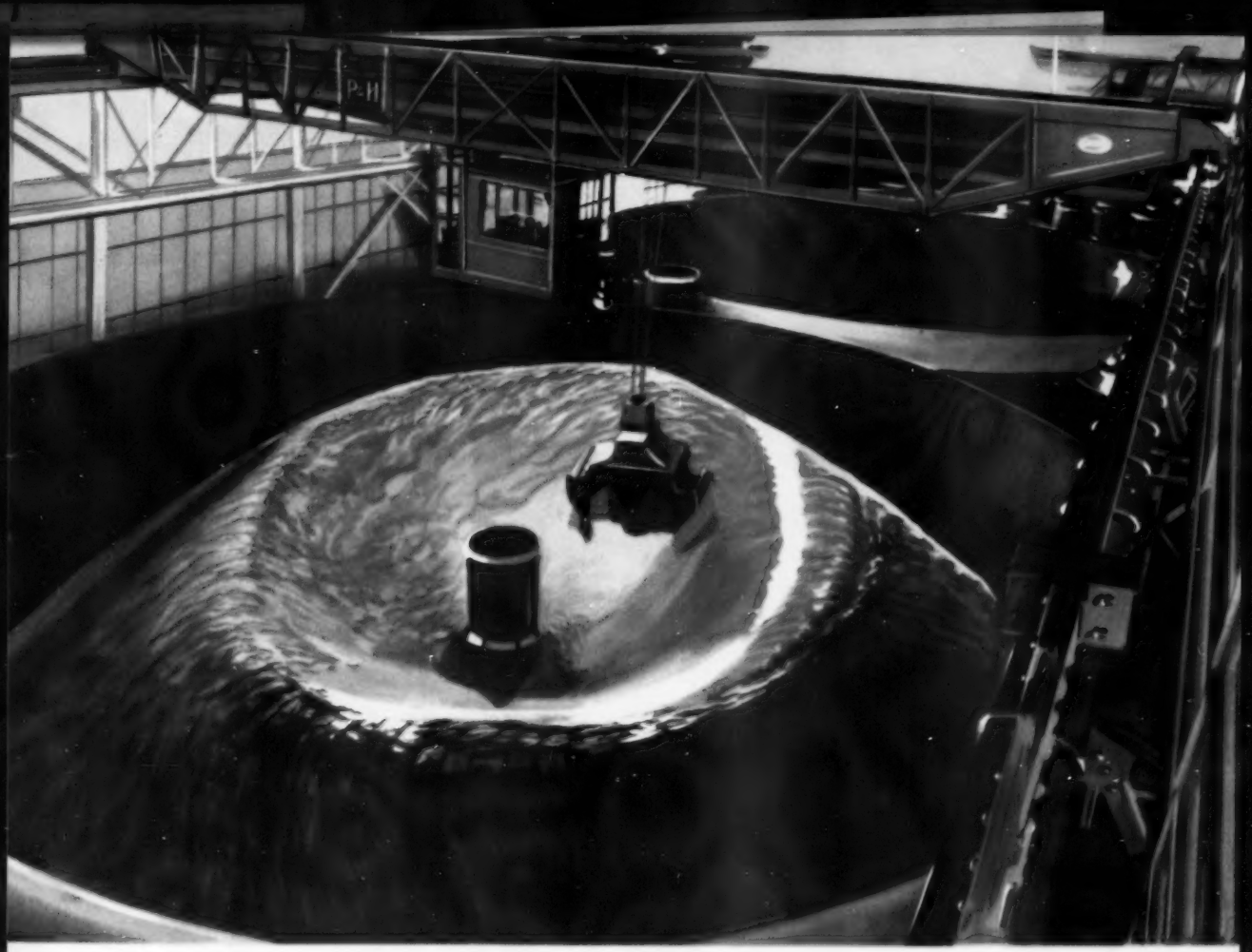
Cutaway section showing details of plug-in mounting arrangement.

I-T-E CIRCUIT BREAKER COMPANY

Small Air Circuit Breaker Division

For more facts circle 624 on Reply card

For more facts circle 625 on Reply Card ⟶



Versatile

...P&H Overhead Cranes are on the job in 107 different industries

From sugar to silica, from lumber to lignite — pick your product or your industry and you'll find a P&H Overhead Crane at work.

For wherever you need competent materials handling on a large scale, P&H Overhead Cranes fill the bill. There are more P&H Cranes in use than any other.

Satisfied users in these varied industries have repeatedly purchased P&H Cranes as their industries expanded. The evaluation of a P&H Crane is based on many years of low-cost operation, and not on initial cost only.

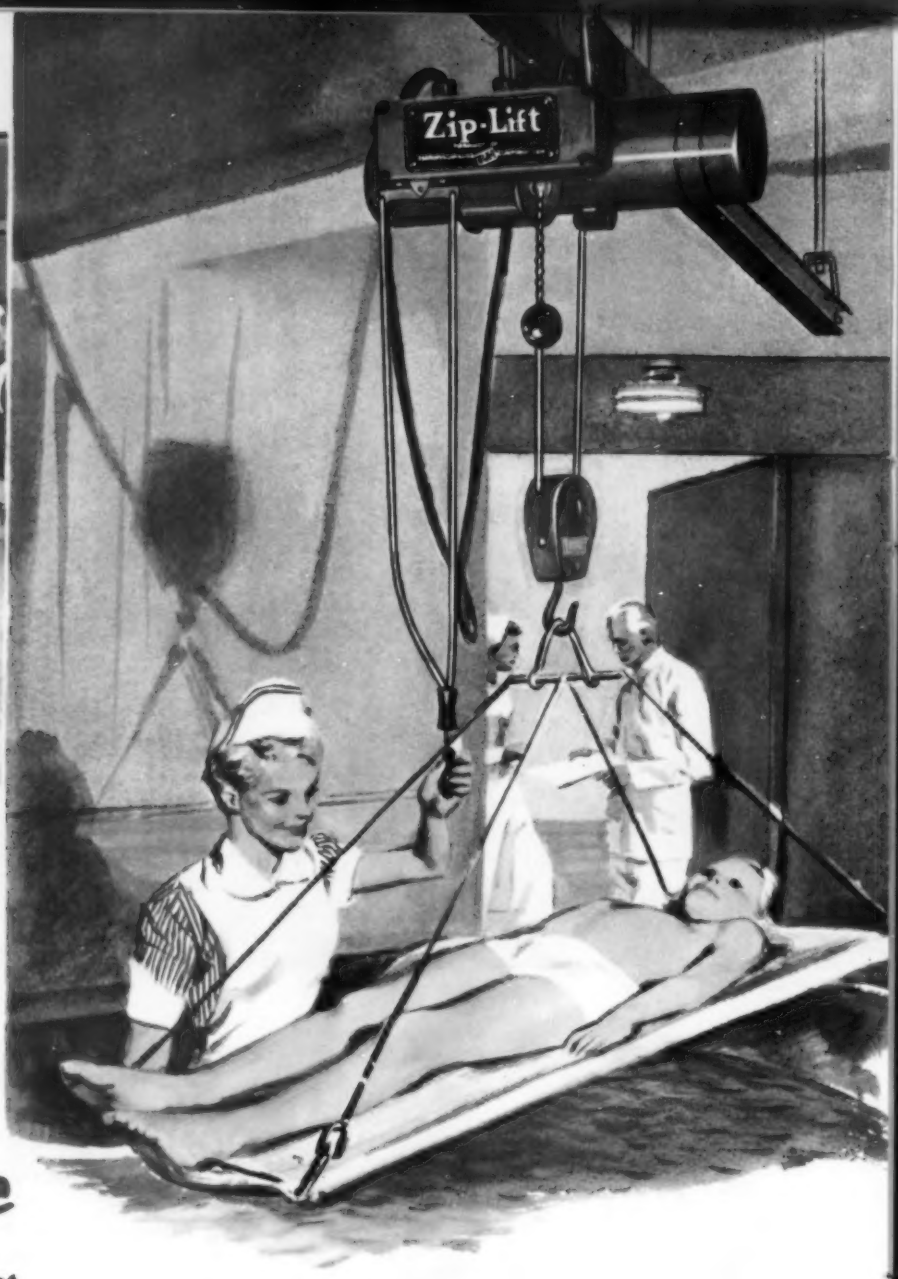
Maybe this year is the year your business will own a P&H Overhead Crane. The time for you to get our experienced engineers on the job is right at the very beginning of your plans. There's no charge, of course, for our advice.

HARNISCHFEGER

MILWAUKEE 46, WISCONSIN

the P&H *Line*

3118



Versatile

... P&H Hoists are not single-purpose hoists; their application is universal

The picture shows a P&H Hoist performing an important function in a hospital therapy room. We've got thousands of P&H Hoists in use in diversified installations — hotels, bakeries, marine storage sheds — to name but a few.

Of course, by far the greater number of installations are made in heavy industry. That's where P&H Hoists have established their great record of dependable service.

Most of us are prone to think of hoist use in the conventional vertical pattern. Yet there are hundreds of P&H Hoists in operation on a lateral, or horizontal, basis. Perhaps P&H can help speed your materials handling by an unusual, versatile installation.

P&H Hoist engineers will be glad to help you. Your nearest one is listed in your phone book . . . or a card to us will bring you both his name, and an appointment suggestion, by return mail.

HARNISCHFEGER

MILWAUKEE 46, WISCONSIN

the P&H *Line*

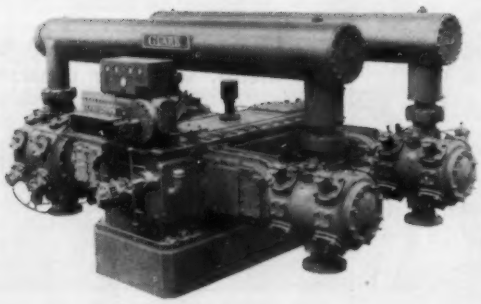
3114

any flat means trouble

but in plant air supply it also means lost production!

Unless your plant air supply has adequate capacity in reserve, you may actually slow down your entire production every time you add a new labor-saving air-operated tool or device.

New increased demands on overloaded or overextended air supply inevitably cause a pressure drop all along the line. That means every tool, chuck and wrench slows down . . . and production suffers.



When did you last check your air at the *end* of the line? If it is going "flat," a Clark Balanced/Opposed Air Compressor will restore full pressure and, at the same time, *provide for a planned reserve to take care of future demand.*

There is a Clark Representative near you ready to give you all the facts. Why not call him now or write for your copy of Bulletin 118?

CLARK BROS. CO., OLEAN, N. Y.
One of the Dresser Industries
Offices in principal cities throughout the world

CLARK®

Balanced
Opposed
Compressors

For more facts circle 626 on Reply Card

Long Beach Calif. High School; Hugh R. Davies, Architect; Smith-Campbell Co., Contractor.

Robertson Offers Free Daylight Engineering!

As one of the world's leading manufacturers of maintenance-free skylights and sash, H. H. Robertson Company is prepared to offer you professional Daylight Engineering Service without obligation. Here's how it works. Upon request, Robertson engineers will look over your drawings and obtain from you a description of the work performed within your building. Robertson engineers will then establish a foot-candle light intensity curve for a skylight and sash design that will be the best combination of economy, practicality and efficiency. A report will be made available to you, including details and specifications to cover recommendations. You can then proceed with the daylighting project or not, as you see fit.

Write now for your free copy of Robertson's new comparative cost study which shows you how to pay for your skylights within a few years from artificial light savings. Use the coupon below.

Robertson Daylight Engineering

H. H. Robertson Company

2440 Farmers Bank Bldg. Pittsburgh 22, Pa.

In England:
Robertson Thain Ltd.
Ellesmere Port, Cheshire

In Canada:
Robertson-Irwin Ltd.
Hamilton, Ontario

H. H. Robertson Company
2440 Farmers Bank Bldg., Pittsburgh 22, Pa.

Please send me free copy of Daylighting Cost Study booklet.

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____ CITY _____

NEW PRODUCTS

(Begins on page 160)

simple maintenance of vital parts. By releasing only three fasteners, the entire case can be removed for examination. Lamps are accessible by the simple removal of the record holder, and they are mounted on swing-outs for convenient replacement.

A pre-focused, flooding-type light source completely eliminates optical adjustments so that lamp replacement does not require the attention of highly-skilled personnel, according to company engineers. The new oscillograph features also a photographic-type time recorder which records the month, day, hour, minute, second, and even station identification at the end of each record. Record length may be pre-selected easily—at 1, 2, 3, or 6 ft. General Electric Co.

44—PIPE CLEANING UNIT does the job quickly

Designed for cleaning out stubborn drain and sewer stoppages in minutes, the Rod House is also reported easy to operate.

To use, you turn the speed handle and the rod is whirled down the pipe, cleaning out rags, scale, sand and grease. It is announced for cleaning clogged wash basins, toilets, urinals and floor drains up to 100 ft. Miller Sewer Rod Co.

45—PROTECTIVE PAINT for metal, wood or concrete

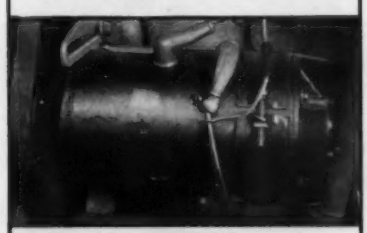
Everwear J-41-B is announced as an all-purpose black coating for protecting metal, wood or concrete against practically every exposure condition. The paint is reputed to form an ebony black finish that is impervious to moisture and resistant to chemical attack by gas fumes and smoke. Because of its penetrating and spreading qualities, it can be used after a minimum of surface preparation. It is claimed to be anti-corrosive above or below grade.

According to manufacturer, J-41-B remains elastic, thus permitting it to expand and contract with metal even during extreme temperature changes. This allows its use on tanks, metal roofs, siding, drains, cables, window frames, machinery. Among its applications in preserving wood are joists, floor beams, posts,

← For more facts circle 627 on Reply Card

Emergency cutout switch breaks all electrical contacts in system.

Fuel system designed to eliminate syphoning.



Generator and starting motor are totally enclosed.

The only Gas Truck safe enough to get GS Approval!

YALE KG51 SERIES

POSITIVE EXHAUST CONTROL

Flame suppressor (top) and **cyclone muffler** (bottom) prevent emission of **hazardous sparks and flames.**

The Yale KG51 Series Gas Truck is the only truck of its type that is GS Approved by Underwriters' Laboratories (U.L. File No. AU-1572). It satisfies all the requirements of the National Fire Protective Association for safe use where combustible fibers or containers of hazardous liquids or gases are being handled in storage. Incorporated into the design are all of the safety features required by Underwriters' Laboratories GS specifications, including those shown at left.

Immediate availability! Yale KG51 Series Gas Trucks—with GS Approval and all the famous Yale engineering features that make Yale trucks the smoothest handling lift trucks ever built—are immediately available in capacities of 3,000 to 10,000 pounds. Send for full facts today about engineering details on Yale Gas Trucks with GS Approval. Write : The Yale & Towne Manufacturing Company, Philadelphia 15, Pa., Dept. **474.**

YALE*

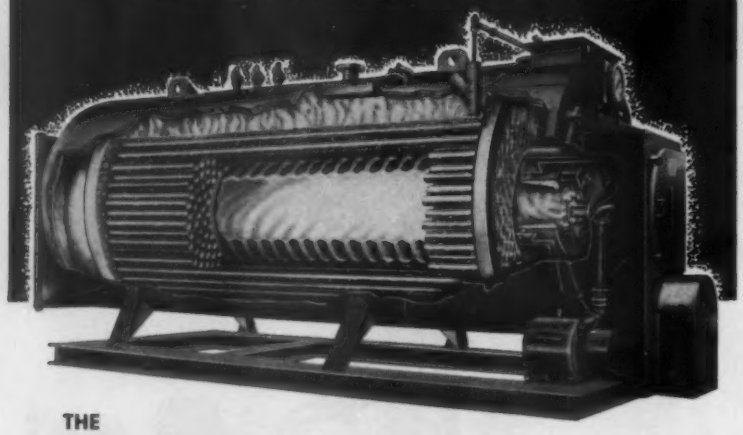
*REG. U. S. PAT. OFF.

INDUSTRIAL LIFT TRUCKS AND HOISTS

Gas, Electric, Diesel, LP-Gas Industrial Lift Trucks • *Worksavers* • Warehousers • Hand Trucks • Hand and Electric Hoists

For more facts circle 628 on Reply Card

GET YOUR
STEAM and HOT WATER
FROM A LOW COST PRODUCER!

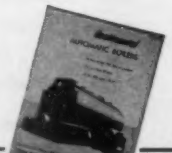


THE
Continental AUTOMATIC BOILER

- generates the steam and hot water you need at low fuel cost and with little maintenance.
- is highly efficient—over 80% guaranteed—due to its unique "spinning gas technique".
- can be opened for cleaning or inspection by one man in less than ½ hour, for it has hinged doors at both ends.
- distributes heat evenly to the rear tube-sheet and all return tubes. This results in balanced water circulation and uniform longitudinal expansion of the entire pressure vessel.
- has long service life because of free, rapid water circulation, uniform heat transfer, simplicity of construction and quality workmanship.

Fully automatic, Continental Boilers are used for hot water and high or low pressure steam applications. Units range from 20 to 500 hp and can be gas, oil or combination fired.

Write for catalog and the name of your nearest distributor. Let us bid on the next boiler you need.



Send for all the facts on the Continental Automatic Boiler.

Continental AUTOMATIC BOILERS
BOILER ENGINEERING and Supply Company, Inc.
2 Manavon St. • PHOENIXVILLE, PA. • Phone 5832
For more facts circle 629 on Reply Card

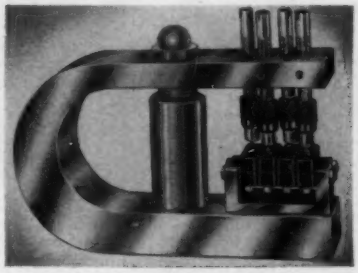
NEW PRODUCTS

(Begins on page 160)

towers. Concrete surfaces for which it is adapted include masonry walls, parapets, footings, retaining walls, brick and cement structures, tanks. Reported not to crack, check, chip, flake or peel, paint dries quickly, can be applied by brush or spray, and is packaged in 5-gal pails, 30 and 55-gal drums. Maintenance, Inc.

46—FORCE GAGE with multiple switching

A device for controlling mechanical forces at various load points is found in this new multi-switch force gage. Available in 11 different capacities, these devices may be ordered with only one control switch or as many as four. Basic design centers around an alloy steel pressure beam made in the shape of a "U." This



is heat treated designed to flex millions of cycles without losing resiliency.

To the lower "leg" of this beam is mounted a yoke in which the switches are set. When load is applied across the center of the beam, it deflects inwardly causing the finely threaded adjustment screws in the upper half of the bar to contact the switches. On a four-switch model, each switch can be set to function at a different load point within the range of the instrument, or all four switches can be made to function at the same load. The adjustment screws can be permanently set and sealed at the factory, or an adjustable model may be specified, if preferred.

These force gages can be clamped to working surfaces or bolted in place. Mounting holes are provided. A steel rod is inserted between the beam so that once full capacity has been reached, the upper half of the beam bottoms against this rod. Further accidental overload then passes through the rod instead of the instrument and cannot injure it or the switches. W. C. Dillon & Co., Inc.

47—CIRCUIT BREAKER works faster to protect wiring

For 120-v a-c lighting and power distribution panels, the ambient compensated Quicklag Circuit Breaker is designed to act with increased speed to protect circuit wiring and eliminate tripping due to ambients varying between 30 F. and 140 F. These combined fea-

Parlon® Stays On

Meets Challenge of Chemicals

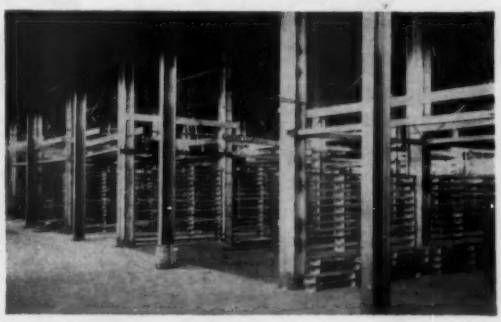
IN A VINEGAR PLANT—To protect a new vinegar-manufacturing building against the corrosive fumes of acetic acid, the interior of this plant was finished with Parlon-based Rigortex, a product of Inertol Co., Inc., Newark, N. J.

No matter how strong the corrosive challenge—whether it comes from acid, alkali or the elements—Parlon-based protective coatings are providing longer protection at lower long-term cost.

Easy to apply and quick drying, Parlon-based chlorinated rubber paints have proven themselves in actual use where other finishes have failed to provide satisfactory service. That's why—for those hard-to-protect surfaces—more and more maintenance people are turning to Parlon finishes to solve their protective coating problems.

No matter how difficult your maintenance paint requirements, chances are there's a Parlon-based coating that will meet them. For full technical data on Parlon, call or write your regular supplier of quality paint finishes or write directly to Hercules.

. . . AND A FERTILIZER BUILDING—The steel structures of this fertilizer mixing building are continually under attack from ammonia gas, nitric acid fumes, compounds containing free sulphuric acid and free phosphoric acid. To meet this challenge, Parlon-based Torex, another Inertol Co. product, was selected.



Cellulose Products Department
HERCULES POWDER COMPANY
INCORPORATED
966 King St., Wilmington 99, Del.

CR56-4

PARLON (CHLORINATED RUBBER) PAINTS ARE AVAILABLE FROM 400 MANUFACTURERS UNDER THEIR OWN BRAND NAMES

For more facts circle 630 on Reply Card

EQUIPMENT THAT STRETCHES INTO THE FUTURE

Most any size or shape of plating tank, pickling tank, storage tank or other processing equipment can be lined or covered with quality ACE hard or soft rubber for protection against corrosion, to resist abrasive wear, or to provide electrical insulation. Ask for Bulletin CE-53.

STOP VALVE CORROSION *at lower cost*

There's an ACE hard rubber, rubber-lined, or plastic-lined valve for every corrosion application. Sizes from 2" to 24". Diaphragm, gate and check types. Free *Bulletin CE-52* lists chemicals that can be handled.

ACE chemical equipment
"more resistant to more corrosives"
Complete line of rubber and plastic processing equipment . . . eight basic materials for pipe and fittings, valves, pumps, tanks, molded parts, utensils, etc.

FOR HIGH PRESSURES OR BIG PIPE LINES

ACE Rubber-Lined Steel . . . strength and pressures of steel plus chemical resistance of hard rubber. Excellent for alkalis, most inorganic acids, many organic acids, all salts, bleaches. Sizes 1¼" to 24" and up. *Bulletin CE-52.*

ACE SARAN PIPE

An old stand-by with many new uses . . . Odorless, tasteless, general-purpose rigid pipe and semi-flexible tubing. Highly resistant to most chemicals. Threaded pipe ½" to 4", tubing ⅛" to ¾". *Ask for Bulletin 351.*

ACE rubber and plastic products

AMERICAN HARD RUBBER COMPANY
93 WORTH STREET • NEW YORK 13, N. Y.

For more facts circle 631 on Reply Card

NEW PRODUCTS

(Begins on page 160)

tures result from a "ten times rating" magnetic trip for short circuit protection, says manufacturer, so that the 15 amp Quicklag Breakers will trip magnetically at 150 amp. True ambient compensation is attributed to a unique bimetal element that permits full rated load in wide temperature variation. Instantaneous circuit interruption is delayed beyond duration of peak currents for tungsten lamps and motor starting. Other features announced include quick-make, quick-break action; bolted type connections; and inverse time limit overload bimetal action. These breakers are supplied in a full range of ratings: 15, 20, 30, 40 and 50 amp. They are described in Catalog No. 1-150. Federal Pacific Electric Co.

48—ATTACHMENT gives lift trucks more flexibility

Swing-Shift Hydraulic Fork Control Units are available for use on several makes of lift trucks. They are designed to pivot horizontally as well as shift sideways making it possible to position

loads more accurately, take loads through freight car doorways, and perform other road-maneuvering tasks. The unit itself comes ready to install and no welding is required in mounting it on the truck. Swing-Shift Units are reported particularly suited to handling of lumber and similar loads difficult to maneuver in restricted areas. It is pointed out that the Swing-Shift Unit—not the truck itself—does the swinging and shifting of the load, letting the forks "turn a corner" ahead of the truck. Swing-Shift Mfg. Co.

49—SEWER VALVE protects against flooding

The Storm Guard Hydraulic Sewer Valve is available in six standard capacities for 4 to 12-in. sewers; other sizes may be ordered. This valve is designed to provide automatic protection against main floor, basement and low-level warehouse flooding when storms cause city sewer systems to back-up. The valve is positive in action, closing with approximately 2000 lb pressure to shear paper, wood, toothbrushes, and other materials that cause many valves to fail when needed most.

The design is simple. When the sewer level rises to the back-up danger point, a float in the Storm Guard valve rises. This float operates an arm which causes city water pressure to close the hydraulic

When workers must operate to close tolerance, Owens-Illinois light-controlling Glass Block provide an extremely effective daylighting system. Daylight is directed upward and diffused over all parts of the room all day long.

The combination of light-controlling glass block and vision strip keep brightness at comfortable levels, provide vision and ventilation.

CBS Hytron Plant, Danvers, Massachusetts

OWENS-ILLINOIS GLASS BLOCK bring better light, reduced maintenance wherever used

In the plant, in the office and anywhere, panels of Owens-Illinois Glass Block make free daylight work overtime.

THE PRISMS within the block spread light evenly over all parts of the room from early morning to late afternoon. Daylight is at a comfortable level, while extensive glare and harsh contrasts are eliminated. No shades are necessary.

Glass block are virtually maintenance-free. They are extremely hard to break . . . can be hosed down to clean. They insulate so efficiently that it is easier to closely regulate room temperatures. And, because Owens-Illinois Glass Block are a modular building material, architects have the widest freedom in their design.

The complete Owens-Illinois Glass Block story is yours for the writing. Send for INDUSTRIAL DAYLIGHTING and see how glass block can mean better sight, better light, lower maintenance and great new design freedom in planning. Address Kimble Glass Company, subsidiary of Owens-Illinois, Dept. PE-4, Toledo 1, Ohio.

OWENS-ILLINOIS GLASS BLOCK
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OWENS-ILLINOIS
GENERAL OFFICES · TOLEDO 1, OHIO

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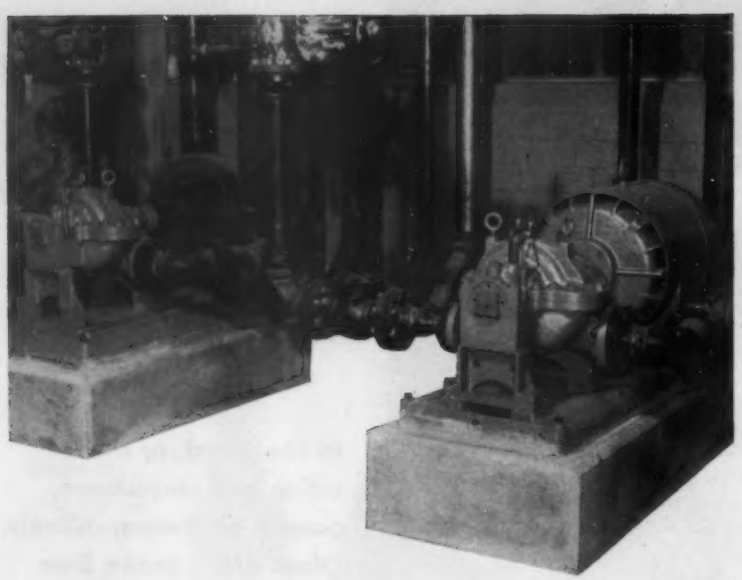

Two Goulds 2 x 3—9 Fig. 3305 two-stage centrifugal pumps on boiler feed service. These pumps are available in five sizes with capacities to 1200 GPM, heads to 1000 ft.

7 *design features*

improve pump operating efficiency

Every one of these features is *standard* with this new Goulds Fig. 3305 two-stage centrifugal pump:

1. Renewable stuffing box bushings.
2. Bearing housings sealed against moisture and dirt.
3. Cowl-type glands suitable for use with quenching liquids.
4. Stainless steel impeller keys.
5. Teflon water-seal rings.
6. Die-formed stuffing box packing.
7. Corrosion-resistant gland bolts.

Together, these seven construction features give you, without extra cost, a quality of service that's unique in general liquid-handling pumps.

The Fig. 3305 offers other advantages, too. For example, you can choose either a conventional stuffing box or a mechanical seal—and change from one to the other at any time. Also, extensive interchangeability of parts helps keep your parts inventory low.

Bulletin 722.6 gives the complete story of Fig. 3305 advantages, including specifications, performance curves, and interchangeability charts. Write for a copy.

Goulds PUMPS INC. Seneca Falls New York

ATLANTA • BOSTON • CHICAGO • HOUSTON • NEW YORK • PHILADELPHIA • PITTSBURG • TULSA

For more facts circle 633 on Reply Card

NEW PRODUCTS

(Begins on page 160)

shut-off valve. During a single storm this valve may automatically open and close several times. It is noted that city water has been used for operation of the valves because it is the most dependable of all power during the time of a storm. This valve is reported to be easily installed and readily accessible. Protection Equipment Co.

50—ADJUSTABLE WRENCH offers faster action

Described as a ratcheting adjustable wrench without any ratcheting device, the Handi-Spin provides faster action by allowing the wrench to remain on a hex head nut all the time while tightening or loosening the nut. Secret of the new wrench lies in its upper jaw which is designed to allow for a secure bite on the nut, yet release the bite when pushed upward. This means that a constant pumping action is possible, manufacturer states. Each time the wrench is down as far as possible, you simply push up to the top and pull down again, getting another secure bite on the nut. Despite this novel action, the wrench is said to work in every way as a regular wrench without slipping when the forward part of the jaws are used. The Tedd Co.

Use the Reader Service Cards provided on pages 225-226 to ask for more information on these products. Circle item numbers of products in which you are interested.

51—VINYL COATINGS to prevent water damage

Magic-Vulc 266 Vinyl Coatings are offered for protecting masonry against damage by water seepage. A feature announced for them is excellent adhesion to masonry surfaces and even to old paint. The coatings are claimed to form a waterproof seal for cinder blocks, concrete blocks, stucco and brick. According to company, they are easy to apply and they flow easily and fill cracks; they withstand a wide range of temperatures; they are suitable for corrosive atmospheres; and they eliminate masonry disintegration. They are available in bright colors. Magic Chemical Co.

52—MERCURY VAPOR LAMP with higher light output

From 10 to 20 per cent more light output, depending on lamp size, is claimed for the Silver-White Mercury Lamp. According to manufacturer, this is the first time a color-corrected mercury vapor lamp has been produced which provides more illumination, rather than less,

Save Money, Maintenance and Man-hours!

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with dependable, long-life

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NO costly, bulky, moving equipment to buy ... no expendable parts to replace frequently ... virtually no maintenance! No wonder Federal's compact, rugged, always-dependable Selenium Rectifier Equipments are the growing answer to DC output requirements ... for industrial power, battery charging and hundreds of other DC applications.

Federal Equipments are ready to connect to your AC source ... ready to deliver uninterrupted DC power wherever you need it and whenever you need it!

Powered by Federal's completely inert selenium rectifiers, the life of Federal Equipments is practically *unlimited*. All are conservatively rated ... with a wide margin of safety to withstand momentary heavy overloads.

If the DC output you need is not in Federal's line of standard power supply equipments, Federal will design and build to meet your specific requirements. Tell us the rating you need ... write today to Power Equipment Department—E-2154.

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Chucks, brakes, clutches, screens, separators, drums, pulleys, lifting magnets, relays, circuit-breakers, solenoids, DC motors—these are only a few of the wide variety of applications now being successfully served by Federal Power Supplies.

Federal's FTR-3152-AS
Typical of the many standard types ready for shipment
Rated:
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AC Input: 220/440 volts
3-phase, 50/60 cycles

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The FTR-3128-BS is designed to meet the exacting requirements of the aviation industry for a regulated and filtered DC power supply useful for laboratory and testing purposes. Front panel control knob enables continuous selection of any DC output voltage between 22 and 30 volts.

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Rated:
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Presently used in a wide range of successful applications for Industry and the Armed Forces, such as:

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Federal Selenium Rectifiers, in partnership with the right magnetic components, provide Magnetic Amplifiers outstanding for:

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High Gain • Fast Response • Low-cost Operation

For more facts circle 634 on Reply Card

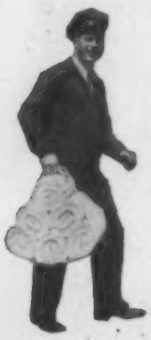
CLARK lowers costs, lifts morale with COTTON TOWELS*

Fairfax Towels used by Clark Equipment Company are supplied by Banner Linen Service, Battle Creek, Michigan

● From the Industrial Truck Division of Clark Equipment Company, Battle Creek, Michigan, comes a wide variety of fork lift trucks for the Army, Navy, Air Force and industrial users. With over 2,000 employees and a vast, sprawling plant, management is naturally concerned with high housekeeping efficiency and the well-being of its "family." To meet both requirements, Clark sees to it that fresh Fairfax cotton towels are always available in all plant and office washrooms.

On the efficiency side of the ledger, Clark finds that cotton towels reduce costs, require little storage space, no inventory. On the employee relations side, they know their employees like the comfort and freshness of cotton, like the better appearance of their rest rooms.

Let the experience of sound management be your guide—give the towel job to cotton in your office building, plant or institution. For free booklet on how cotton towel service will help you, write Fairfax, Dept. P4, 65 Worth St., New York 13, N. Y.



Here's How Linen Supply Works . . .

You buy nothing! Your linen supply dealer furnishes everything at low service cost—cabinets, pickup and delivery, automatic supply of freshly laundered towels and uniforms. Quantities can be increased or decreased on short notice. Just look up LINEN SUPPLY or TOWEL SUPPLY in your classified telephone book.

Clean Cotton Towels . . .

Sure Sign of Good Management

Fairfax Towels

A PRODUCT OF WEST POINT MANUFACTURING CO.

WELLINGTON SEARS CO., SELLING AGENTS, 65 WORTH STREET, NEW YORK 13

For more facts circle 635 on Reply Card

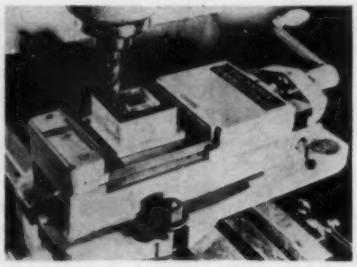
NEW PRODUCTS

(Begins on page 160)

than clear mercury vapor lamps. In developing the lamp, company engineers used a new type of phosphor as a bulb coating—it produces a silver-white appearance unlike the strong blue-green color of most mercury lamps. The high light output and "efficient" color not only suggest its use in high bay lighting, but also in parking lots and building exteriors. Silver-White Lamps are being made initially in four sizes: 100-w, 175-w, 400-w BT 37 for general lighting, and 400-w R57 for high bay and reflector use. Sylvania Electric Products, Inc.

53—IMPROVED VISE cuts down production time

The IMP Hold-Down Vise is engineered to pull the work downward when closed so that seating is accurate and machine setups are much faster than by most methods. The vise has two hinged automatic pull-down jaws. In open position, the heel of each jaw rests on four spring-loaded buttons which hold the clamping surface 1/32 in. above the clamped position. As the vise is tightened these jaws



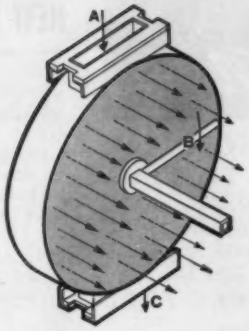
continue to hold that downward movement against the buttons until the heels of the jaws make contact with the counter. The counter or heel of the jaws is seated in a 4-deg dovetail on either side, thus accounting for the holding pressure of the hold-down jaws. The vise clamps both laterally and downwardly at the same time, it is explained, and work is held as flat on the base—as though by magnetic force.

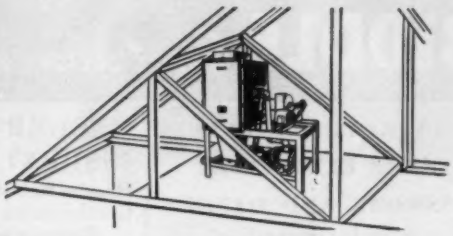
Several other advantages are announced for the vise. With it no parallels are required, and no hammering is necessary. It takes only one hand to put the piece in the vise and clamp it tight. Also, close tolerances can be held on interrupted cuts, says manufacturer, and the hinged jaws can be rotated back 180 deg to permit easy cleaning of base. The vise has a 4-in. capacity. Jaw width is 5 in. Illinois Metal Products.

54—MASKING TAPES in two all-purpose types

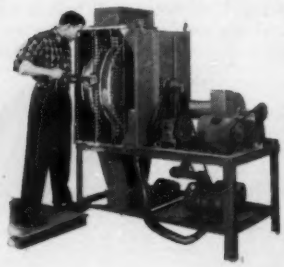
Permacel 708 and Permacel 718 utilize flat 30-lb kraft paper backings, processed and impregnated to give flexibility and internal stretch. The adhesive used is a transparent, rubber based, pressure sensitive type with heat- and strain-

1 Air and dust enter filter drum through top (A). Air passes out through filter disc (shaded) leaving dust on inside. Jet arm (B) rotates around disc blowing reverse-air jet back through filter, dislodging dust. Dust falls out bottom of drum (C) into hopper.

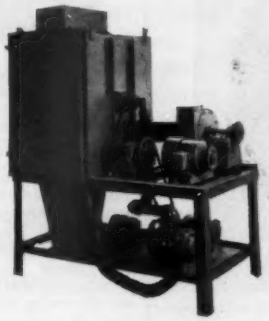




2 Models from 520 to 4800 CFM capacities. Hang from rafters, place in corner, on platform—easily installed anywhere. Factory assembled—comes in "package."



3 Automatic pressure control* maintains ideal filter-surface conditions by cleaning filter discs only when they need it and not over-cleaning them. *Continuous* high-efficiency is assured, filters last longer.



4 High-efficiency *felt* filtering material cleans more than 5 times as much air per sq. foot as ordinary woven cloth filters. Synthetic felts used for special applications. See how you can save time, money, space in your own operation with a Model D Aeroturn.

EXCLUSIVE! Continuous automatic operation with *New* Koppers Model D Aeroturn Dust Collector . . .

over 99.9% continuous efficiency! The "heart" of this new Koppers Model D Aeroturn (see illus. 1) is the *reverse-air-jet action*. This reverse air cleans the filter discs, *maintains* ideal filtering conditions *automatically!* Pressure controls action by switching air jet arm "on" when pressure rises . . . "off" when pressure is normal for highest efficiency.* When "on" the air jet arm rotates around bag radially —blowing an even-pressure air blast into the felt filter disc—agitating and dislodging dust accumulation, making it drop off inner wall into the hopper. No excess wear to "high-efficiency" felt disc—no unnecessary use of air jet mechanism—no stopping to clean filter. This completely automatic "package" dust collector solves your filtering problems with over 99.9% *maintained* efficiency.

New Series 12 Aeroturn for bigger dust filtering jobs, material reclamation. Standard sizes from 1,000 to 60,000 CFM—special units designed for greater capacities. Up to 99.9%+, a high "clean-air" efficiency.

AEROTURN DUST COLLECTORS

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***Engineered* Products**
Sold with *Service*

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For more facts circle 636 on Reply Card

BIDDLE *Instrument News*

BIDDLE MOTOR ROTATION TESTER ELIMINATES GUESSWORK AND DANGER

SAVES TIME in Electric Motor Hook-Ups

This tester eliminates the need for temporary connections which can be time consuming, costly, and quite hazardous, particularly where many large high-voltage motors are involved. With this instrument you can very easily determine direction of rotation for any size 1, 2 or 3-phase motor, and make your first connections *permanent* ones with safe assurance they are correct. You can use it also to test circuits, check phase sequence and identify windings of multi-speed or multi-voltage motors.

Write for BULLETIN 80-PL

MEGGER® ELECTRICAL INSULATION TESTERS

Hand—Rectifier—or Combination Operation—

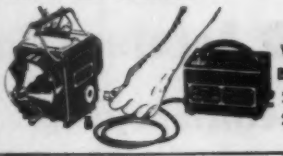
Ratings up to 2000 Megohms and 1000 Volts D-C

HAND CRANK MEG TYPE

of Megger Insulation Tester is a reliable field instrument, light, sturdy, with a constant-voltage type generator—no dependence on batteries or other current supply. By far the most popular instrument among electrical plant maintenance men. Easy to use—easy to read—and rugged in constant services.

RECTIFIER OPERATED Meg Type of Megger Insulation Tester simply plugs into a convenient outlet. Portable or flush bench-mounted. A dependable production or inspection instrument. Quick, easy readings speed up otherwise costly tests.

DUAL-OPERATED MEG TYPE of Megger Insulation Tester may be operated by hand or rectifier. Excellent solution for those requiring a versatile instrument for field and bench use.



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B-525

Frahm® Resonant Reed Tachometer Quick Accurate Readings with Safety BULLETIN 31-PL

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PHILADELPHIA 7, PA.

For more facts circle 637 on Reply Card

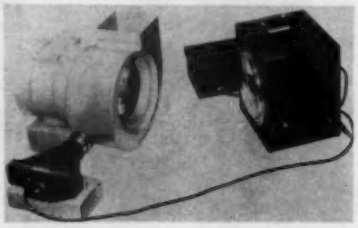
NEW PRODUCTS

(Begins on page 160)

resistant properties. Permacel 708 is suggested for high-speed production line masking operations and Permacel P 718 for general industrial masking. Both may be utilized as a slasher tape in textile work, as a sealer for cannisters, cartons and boxes, and for protection of polished and machined surfaces. Tensile strength of the tapes is given as 20 lb per inch of width; tear resistance, 3½ lb edge tear; Permacel Tape Corp.

55—BALANCING VIBROMETER in machine, hand models

When used with a stroboscope, the Davey Balancing Vibrometer with built-in neon tube makes a simple, inexpensive balancing device, it is announced. The instrument

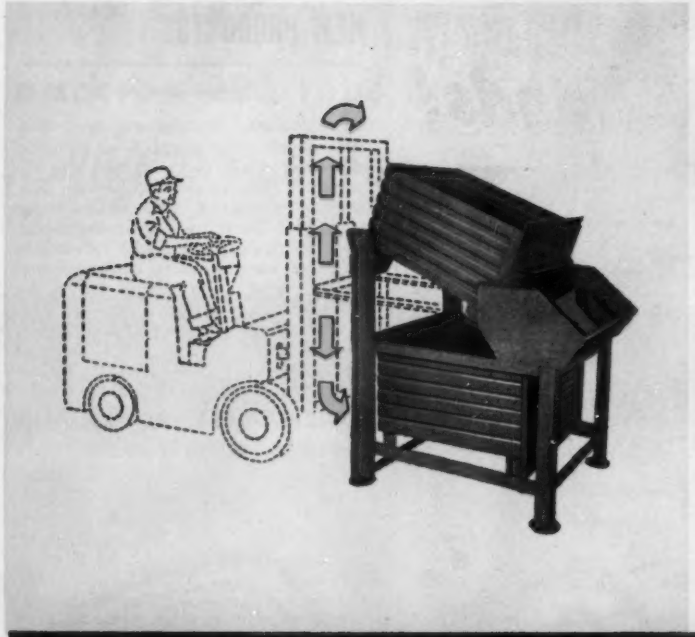


can be supplied with an adapter unit wired to suit a General Radio Co. Strobotac. Made in various sensitivities, it measures vibration amplitude and "high spot" on machines to be balanced. It is available in bench models which exert a pressure of only 1 oz on the machine being balanced, or in hand models with heavier pressure for stability. The hand models are adapted for either bearing or shaft measurement. The Vibroscope Co.

56—SHELTER HOUSES composed of modular sections

The do-it-yourself idea has been applied to these new porcelain enameled shelter houses. They are constructed of interchangeable, modular sections resulting in two basic sizes—one section wide by two sections long, and one by three sections. Either size can be modified. The shelter houses are suggested for guard shelters, yard offices, scale houses, toll gate shelters, service stations, and instrument houses. Each modular section is a double-faced box panel that presents both exterior and interior wall surfaces of porcelain enameled steel in a single unit. The ceiling sheets are also porcelain enamel finished as is the sectional hip roof with 6-in. overhanging eaves. Sash and door sections, interchangeable with the solid wall sections, are porcelain enameled, except for the glass areas.

The plant engineer can design his own shelter house from interchangeable standard sections, determine its exact cost, and elect to have it delivered completely assembled, or crated in knock-down form for assembly at the site. There are five different styles of standardized, fully



HANDLING

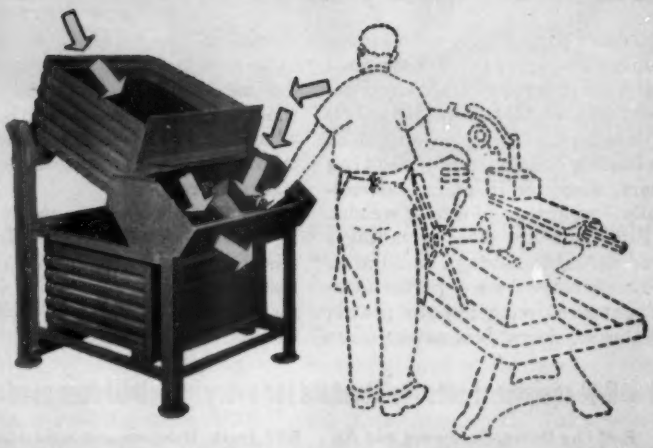
Powell's strikingly simplified Flow-matic® system of mass material handling has proved it can increase the efficiency of the lift truck operation by as much as 30 percent. The entire operation, both working and receiving units, is confined to a single compact station, easily accessible to lift trucks. This reduces floor area required and eliminates time-consuming "lift truck jockeying."

Only *FLOW-MATIC** Saves Both Ways!

PRODUCTION

Because it is a single-station unit, machine operator fatigue is substantially reduced. He need only make a single movement to both dispose of finished piece and select one to receive work. Too, because the entire unit requires a minimum of floor area, machines can be spotted closer together, permitting more efficient use of available space.

Before you place your order for materials handling equipment, be sure you have acquainted yourself with Flow-matic®. Contact the Powell representative in your area or write direct for full details.



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Title _____ Company _____

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Look! No Hands!

R-W Electrical Industrial Door Operators work easy as pointing a finger... automatically!

You don't pay a penny *extra* for the trouble-free dependability designed and built into every R-W electrical door operator. Like magic, Richards-Wilcox operators open and close swinging... sliding... folding doors, singly or in pairs, *automatically*—regardless of size or weight.

But there are *other* advantages too: valuable savings in time as products move from department to department within your plant; greater efficiency and safety since no manual operation is necessary—cable switches, push buttons or radio, magnets or electric eyes see to that! Because doors are tightly shut when not in use, heating and humidity-control costs are also substantially reduced.

Find out how *you* can profit with R-W Automatic Electrical Industrial Door Operators in your plant. For complete details, write today for Catalog No. A-87. No obligation, of course.

R-W equipment sets the standard for every industrial door need

R-W Fire Doors, Hardware and Accessories . . . are Underwriter's and Factory Mutual Laboratories Approved for all Class A-B-C-D-E and F openings, in a wide variety of constructions including flat surface, all-steel and corrugated sheet metal. Sliding, hinged or vertical doors with flat or round track, single or double-link hardware.

R-W Track, Hangers and Industrial Door Hardware are manufactured with precision and care—to give you the ultimate in quality and service. Ask about R-W "Lock-Joint" tracks and hangers for sliding doors . . . R-W hardware for swinging, folding or overhead doors . . . for all types of industrial doors weighing up to 3000 pounds each.

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NEW PRODUCTS

(Begins on page 160)

interchangeable modular sections — solid wall, sliding sash, sliding door, swinging door and hinged door sections. All are wired for 110-v single-phase service. For interior lighting, the three section house is provided with two Swivolier lamps and two double outlets; the two-section unit has one Swivolier lamp and one double outlet. The trough under the overhanging eaves also is wired for 110-v service for exterior lighting. Standard sections are finished in white, but can be had in colors. The Erie Enameling Co.

57—ENAMELS for touch-up jobs, come in spray can

Industrial advantages claimed for Instant Spray Finishes are speed of application and fast drying qualities. Specially developed for industry, the paints come packed in aerosol cans with self-cleaning nozzles of special design. Partly used paint cans can be used again months later, manufacturer points out, and there is no clean-up and almost no make-ready. The line includes a wide range of colors in enamel, also aluminum paints, varnish, plastic and lacquer finishes and primers. Tempo Products Co.

58—SELF-CLOSING LID for garbage cans

The Push-Top Lid will convert a standard size can to a self-closing refuse receptacle. The lid is snug fitting yet easily removed. It is suited for use in

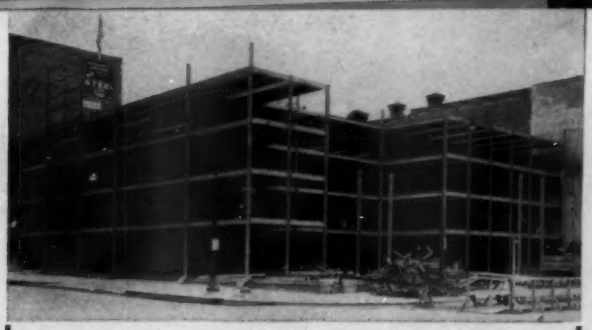
locker rooms, lavatories, plant cafeterias, and recreation areas, or in production areas where use of wiping cloths and other waste material constitute a fire hazard. Said to be the lowest priced self-closing lid on the market, this one is made of 24-gage Perma-Zinc sheet steel with an 8⅜-in. opening and available in sizes to fit 20-gal, 27-gal, and 33-gal size cans. Inside double spring tension keeps lid firmly closed when not in use. The Witt Cornice Co.

59—INDUSTRIAL TRAILER with longer carrying platform

This 8000 lb capacity industrial trailer is reported to have the advantages of longer length with resultant increased carrying area and improved trailer hitch. Trailer has a one-piece checkered steel plate carrying platform of 128 in. in length and an overall length of 135⅜ in. It is

For more facts circle 640 on Reply Card →

Sioux City cars park on 223 tons of *Multigrip* Floor Plate



Framework for this open-sided, Sioux City parking garage is made of USS Structural Steel, furnished by the Missouri Valley Steel Company. The building was completed in just 57 days.

A section of reinforced USS Mutigrip Floor Plate (long enough for two cars) is swung into place in this Sioux City Parking Garage. Multigrip's evenly-spaced, flat-topped risers will give non-slip traction plus long-lasting service. Because of the garage's virtually all steel, open-sided construction, expansion will be greatly simplified.

Just 57 days after delivery of materials, Sioux City drivers were parking in this four-story Sioux City Parking Garage. The open-sided garage isn't complicated—but it's there to stay. Structural framework consists of rugged USS Structural Steel while the flooring is USS Multigrip Floor Plate.

There were three very good reasons for choosing Multigrip as flooring. Flat-topped, evenly-spaced risers offer non-slip traction for feet and wheels, even when the plates are wet. By attaching Multigrip to steel flooring supports, whole sections of floor could be swung into place by a crane with a minimum of trouble and preparation. And, should it become necessary to expand this garage, there will be no need for expensive alterations or redesigning. It will be as simple as erecting more framework, attaching additional Multigrip to supporting beams, and swinging another section of parking space into service.

USS Multigrip is ideal for use where floors take a severe beating or where slipping accidents must be avoided. These rugged steel plates won't chip, crack or splinter. Evenly-spaced risers offer positive traction and easy cleaning as well as drainage in *all* directions. Multigrip can be formed or bent where necessary and is available in large plates, minimizing installation waste. Where wearability and safety are important—always specify USS Multigrip Floor Plate.

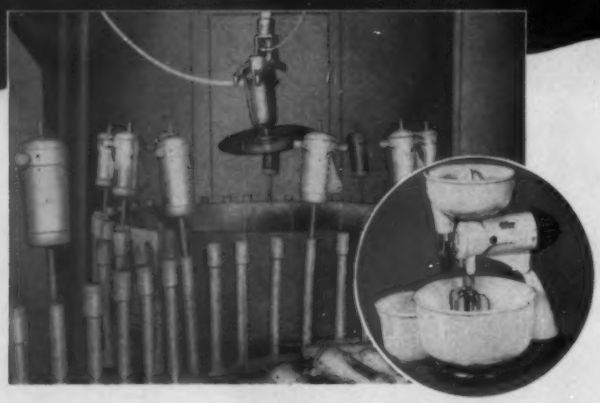
UNITED STATES STEEL CORPORATION, PITTSBURGH
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, CHICAGO
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS multigrip FLOOR PLATE

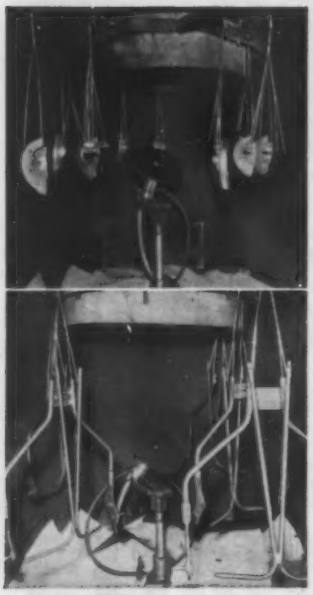
Sold by leading distributors from coast to coast

UNITED STATES STEEL

Sunbeam is particular about the uniform high quality finish on their products, so SUNBEAM relies on RANSBURG NO. 2 PROCESS Electrostatic Spray Painting



Along with improving the quality of the brilliant white finish on Mixmaster parts, an 80% paint savings was achieved when SUNBEAM switched from hand spray to RANSBURG Electrostatic Spray Painting



Protective clear lacquer is applied to upper saw guard (upper left) with RANSBURG NO. 2 PROCESS on this line in SUNBEAM's plant 2, Chicago. Other hardware items, including the Drillmaster and Sunbeam Sander are lacquer-coated electrostatically here. Lawn mower parts, such as the handles shown (lower left), the Rain King lawn sprinkler base, and the Sunbeam Fryer base also are painted efficiently with Ransburg No. 2 Process Electro-Spray.

Regardless of the type of product you manufacture, if it's painted—and if your production justifies conveyorized painting—you should look into the savings and improved quality which can be yours with one of the Ransburg Electrostatic Processes. May we tell you about complete Ransburg services, including the test painting of your products in our laboratories?

WRITE TO DEPT. P.E.

Ransburg ELECTRO-COATING CORP.

RANSBURG

Indianapolis 7, Indiana

For more facts circle 641 on Reply Card

NEW PRODUCTS

(Begins on page 160)

available in platform widths of 38 in. and 48 in. Trailer hitch is a simplified device which is connected or disconnected on either end of trailer by removal of a single pin. It has four-wheel steer accomplished through levers and connecting rods to assure perfect trailing regardless of number of trailers in a train. In addition to checkered steel platform, trailer is available with a sturdy oak platform, steel bound with armored ends. The Yale & Towne Mfg. Co.

60—FLOW INDICATOR, ball-type, has dual scale

This ball-type Flow Indicator provides a dual scale for approximate measurement of water flow in gpm and air flow in cfm. Thus, it is explained, this inexpensive but sturdy instrument is versatile for industrial use. The indicator uses a ball on a guide rod, installed in a tapered glass tube to indicate flow in a pipe line. When fluid, water or air, flows from inlet at bottom to outlet at top, it exerts force on the free moving ball causing it to rise in the tube, higher as the rate of flow increases. Position of ball in relation to scale graduations gives an approximate indication of flow rate.

This type flow indicator is suggested for use when flow is from one direction only —bottom to top in vertical pipe lines, and when observation from any direction is desired. Made of bronze, the indicator is carried in ¼ in. to 2 in. pipe connection sizes. Full information on this instrument is given in Bulletin 18W. Schutte and Koerting Co.

61—PIPE JOINT CEMENT lubricates and seals

Stay-Tite Pipe Joint Cement, according to manufacturer, effects economies three ways: it does not harden in the can; it retains its sealing qualities indefinitely; and it remains in a plastic state after being applied, so that fittings can be removed at any time without breakage. Stay-Tite is claimed to have good consistency, to prevent friction when joint is made up; to compensate for tool marks, imperfect threads or other surface irregularities, and to protect the threads from rusting. It flows on smoothly and evenly, says company, and is clean to use and easily wiped off hands. Stay-Tite is declared equally effective on high or low pressure piping for hot or cold water, steam, air, oil, gasoline and gas—including butane or propane. J. A. Sexauer Mfg. Co., Inc.

62—EXPANSION UNIONS for use in hazardous locations

This one-piece sliding sleeve expansion union is designed to compensate for conduit which has been cut too short, and at the same time eliminate the need for springing conduit to one side during

NEW PRODUCTS

(Begins on page 160)

installation. Made in standard (UNY and UNF) and extra long lengths (UNYL and UNFL) these condulets are smaller in diameter than conventional unions of the UNY and UNF types, and come in ½, ¾ and 1-in. sizes. Manufacturer says they are readily used where unions of larger diameter would make connection difficult.

The union is factory assembled as a one-piece union. It consists of two cylinders, one fitting inside the other. The longer union expands to compensate for errors in cutting conduit too short, and can thus be used as an extension fitting. Surfaces mate accurately assuring a long enough contact to prevent passage of flames at full expansion, it is explained; these condulets thus meet specifications for use in hazardous areas where explosion-proof and dust-tight features are required. Also, locking and grounding springs afford positive grounding continuity. Crouse-Hinds Co.

63—PLASTIC PANELS with low flame spread rating

These fire retardant plastic panels are announced as carrying the UL label showing flame spread rating 40 to 75. The panels are produced with new Hetron polyester resins and reinforced with Fiberglas and nylon. They meet many code requirements, says manufacturer. Building officials classify the material as "fire-retardant", "slow burning," or "self extinguishing." The panels are translucent, and provide diffused glare-free light for improved working comfort. Being shatterproof, they reduce maintenance, it is pointed out.

It is noted that use of the self extinguishing resins in no way affects other characteristics of appearance and strength. They are available in corrugated and flat sheets; heavy and medium weights; aqua, green, clear, amber. Filon Plastics Corp.

64—MIST LUBRICATOR for distribution of oil

The MistOmatic Spray Control is designed for automatically applying a controlled, pre-measured quantity of mist lubrication on open gears, chains, cams, rollers, eccentrics, slides and ways, circular saws and similar surfaces. It was designed for use in conjunction with company's power-operated, time-clock controlled centralized lubrication systems which, in combination, permits automatic, simultaneous lubrication of both closed bearings and open surfaces at pre-set time intervals. The spray control valves are also suggested for spraying pre-measured quantities of lubricants, paint, glue and similar materials on production lines. According to manufacturer, benefits include: uniform automatic lubrication without waste; elimination of spoilage from drippage of excessive lubricant; greater safety. Lincoln Engineering Co.

(More Products on page 252)

Faultless CASTER MATERIALS HANDLING FACTS

CONTINUOUS PRODUCTION LINE STEPS UP OUT-PUT AS MUCH AS 25% TO 40% PER DAY AT LENOIR CHAIR CO.

1100 Series Swivel Plate Caster shown with Ruberex Wheel. Cut away shows two full rows of hardened ball bearings in lubricated, dust-proof, hardened raceways.

Here is the Faultless way for any plant to control costs and increase sales. In this case, chair frames and upholstering materials start at a given point and arrive at the crating area precisely as timed. Faultless Industrial Casters keep the all-steel trucks moving without interruption. Trucks are attached to a continuous under-floor chain drive that automatically flows through a series of work stations . . . maintaining predetermined costs . . . providing the sales department with quicker deliveries and competitive prices.

FAULTLESS CASTERS ARE BUILT FOR TOUGH JOBS

Here, again, a prominent manufacturer of fine products employs dependable Faultless Casters throughout a complete production line system. As a result, the Lenoir Chair Company, Upholstering Division of Broyhill Furniture Factories, has enjoyed a considerable increase in the numbers of units processed per day in this plant. Faultless Double Ball Bearing 1121-4TG Swivel, and 1721-4TG Rigid Plate Casters are standard equipment on the trucks. 1100 Series Casters have a king bolt micrometer adjustment of swivel raceways to suit individual conditions. Hardened and polished ball bearings and large diameter hardened raceways that are factory lubricated, assure friction-free movement and long life. Thread guards on each caster prevent winding of textile ravelings around wheel axles and assure hour-after-hour uninterrupted operation. Faultless cushion Tread Ruberex Wheels assure quiet operation and the plant's smooth cement floors are protected against wearing and chipping.

1700 Series Rigid Type Caster with Ruberex Wheel. Horn, consisting of two heavy gauge steel side members and welded "Bridge" member, especially strong construction.

MAIL THIS COUPON TODAY

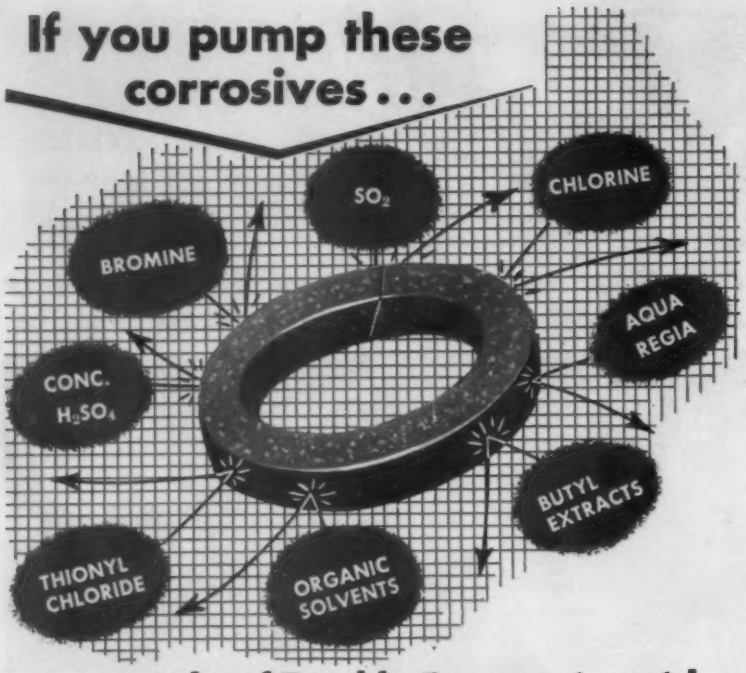
FREE Faultless Industrial Caster Data now ready for you, no obligation. Dept. PL-4

☐ File Folder of Caster Specifications
☐ Wall Chart of Caster applications

Name_____
Firm_____
Title_____
City_____ State_____

FAULTLESS CASTER CORPORATION
EVANSVILLE 7, INDIANA
Offices in Atlanta, Baltimore, Boston, Buffalo, Chicago, Cleveland, Dallas, Detroit, Grand Rapids, High Point, Indianapolis, Los Angeles, New Orleans, New York, Philadelphia, Portland, Seattle, St. Louis, Canada: Stratford, Ontario.

For more facts circle 642 on Reply Card



Get months of Trouble-Free service with

CHEMPRO TEFLON PACKINGS

If your pumps and valves handle highly corrosive industrial chemicals, CHEMPRO TEFLON PACKINGS will drastically cut packing replacement and maintenance costs. CHEMPRO Packings *last for many months* under corrosive conditions which make ordinary packings useless in days or even hours. They stop leakage by providing a tight seal at only slight gland pressure, and their very low coefficient of friction often makes lubrication unnecessary.

TEFLON* PLASTIC STUFFING BOX PACKING

Ideal for either centrifugal or reciprocating pumps operating at speeds up to 3600 R.P.M. handling corrosives at temperatures from -118° F. to 525° F. Style No. 101 composed of 94% shredded Teflon and chemically inert graphite as a friction reducer. Style No. 201 same as No. 101 except that mica is used as friction reducer. Both styles made to fit every size stuffing box on standard process equipment.

TEFLON V-TYPE PACKINGS

For reciprocating pumps and hand, air and motor operated valves handling corrosive materials. Lips of very sensitive pressure rings expand proportionately to increased operating pressure thereby preventing leakage. Suitable for temperatures from -150° F. to 550° F. Unsuitable for centrifugal or rotary pumps. Supplied in bulk or in complete sets to fit specific stuffing boxes.

Chemical & Power Products engineers are packing and gasket specialists with complete fabricating facilities to meet your specific requirements. Write for our complete Teflon Packing and Gasket Catalog.

*du Pont Trademark

CHEMICAL & POWER PRODUCTS, INC.

The Original Fabricators of Teflon Packings and Gaskets

7 Broadway, New York 4, N. Y.

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NEW BOOKS

for the plant engineer

On Aluminum Machining

MACHINING KAISER Aluminum. Size 8½ by 5½ in.; 1955 edition; 308 pp; illustrated; cloth bound. Published by Kaiser Aluminum & Chemical Sales, Inc., 228 No. LaSalle St., Chicago 1, Ill. Personal copy price, $2.00.

DATA DERIVED from both research and practical experience and a number of production job case histories are included in this comprehensive book on all phases of machining aluminum.

Information has been divided into operations that can be expected to be performed on aluminum. General headings deal with milling, turning, drilling, reaming, tapping, boring, shaping, planing, broaching, grinding, filing, sawing, nibbling, general machinability and cutting fluids.

Much material has been collected and correlated from specialized fields, along with a great selection of factual data, tables and charts. More than 170 photographs and tooling illustrations, 75 tooling drawings and diagrams and 40 tables, charts, and nomographs are employed. The book includes several pages of definitions of words which are related to machining operations. Speeds and feeds for various types of machining are given in table form.

Production

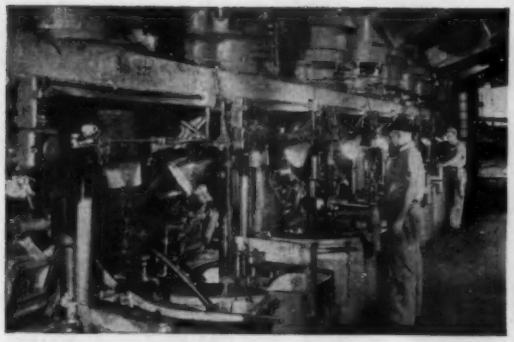
SUCCESSFUL PRODUCTION PLANNING and Control. Size 9¼ by 6¼ in.; 202 pp; cloth bound. Published by American Management Association, 1515 Broadway, New York 36, N. Y. Price $5.50 non-members.

MUCH OF THE INFORMATION presented in this report had been prepared for a conference on production planning and control held in New York in the summer of 1955. Some of the material has been gathered from other AMA publications.

The list of authors includes executives from industry, engineers and consultants. Some of the factors in a successful program that are treated in the book are: budgetary responsibility, effective inventory management, quality control as an aid to production and use of incentives.

Groups and individuals contributing to production planning and control are also covered in this report. Among these are: the purchasing group, traffic department, production (industrial) engineer, and product manager.

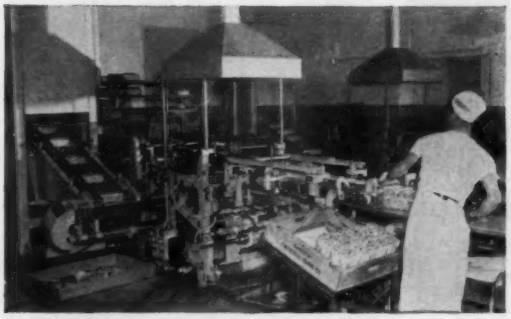
The bearing of plant engineering and maintenance operation on produc-



Protecting syrup against carmelizing *at American Molasses Co. is the responsibility of Honeywell temperature and pressure controllers working with a* ***Modutrol*** *valve. The controllers are interlocked so that burning in the heater is prevented, and product quality is safeguarded.*

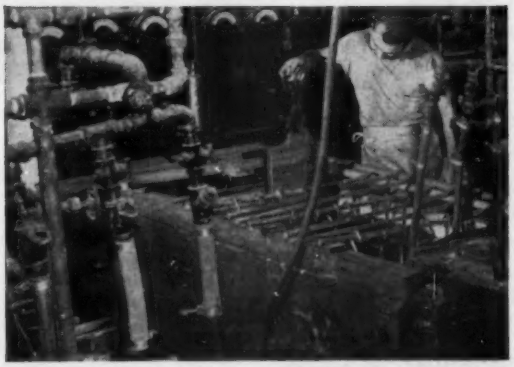
Honeywell Controller Cost—$215.00

Honeywell Industrial Controls



Air-conditioning bread as it cools *helps the Continental Baking Co., Portland, Oregon, to protect palatability. Honeywell Proportioning Temperature Controllers and Humidistat regulate sprays and air dampers to keep conditions right.*

Honeywell Controller Cost—$50.00



Plating solutions *are held at correct temperature for best quality of finished electrotypes, at the Kingsboro Electrotype Corp., Brooklyn, N. Y. . . . by means of Honeywell Remote Bulb Controllers.*

Honeywell Controller Cost—$29.00

improve quality

Don't overlook these simple, low-cost controllers...they're the ideal solution to hundreds of problems.

IN PRACTICALLY any plant, there are dozens of spots where simple, inexpensive Honeywell Industrial Controls can be put to work to improve the quality of production. The examples pictured here give only a few of the ways that this versatile family of controls can regulate temperature, pressure, vacuum, liquid level and humidity . . . the variables that directly affect quality of finished goods.

For your specific application, you can choose from more than 7000 different models in the Honeywell Industrial Controls line. All are simple in design, rugged in construction, modest in price. All are backed by the precision manufacturing know-how and extensive application experience of the world's largest manufacturer of controls. In addition to improving quality, these controls can also be relied on to increase production, reduce maintenance, increase safety and cut costs.

Ask your local Honeywell sales engineer to discuss how you can apply these controls in your own plant. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division,* Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.

Also manufacturers of a complete line of precision measuring, recording and controlling instruments.

MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS
First in Controls

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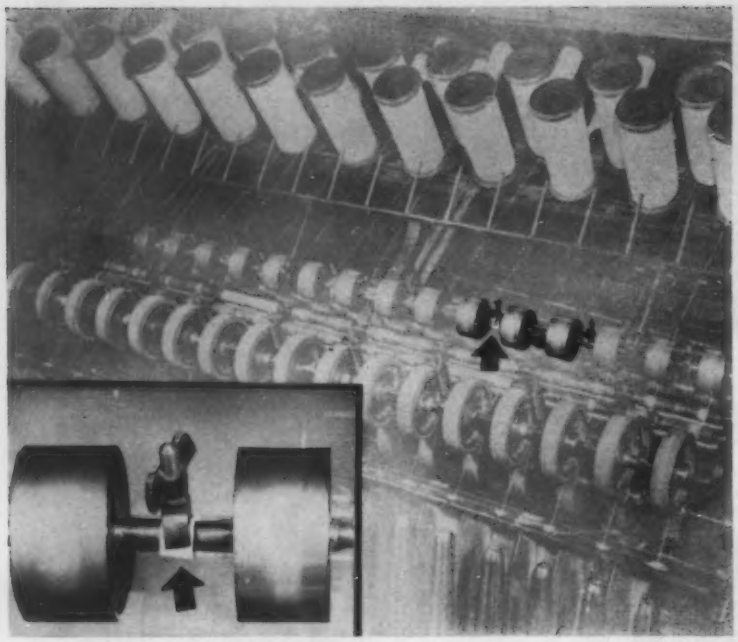


Long-wearing **POLYPENCO** Nylon solves another maintenance problem

• To overcome expensive yarn losses encountered through oil-staining, a Philadelphia yarn manufacturer installed new bearing liners cut from Polypenco Nylon strip. These low-friction bearing liners not only completely solved this costly problem by eliminating the necessity for lubrication, but also provided smoother, quieter operation and longer life.

Wear-resistant parts machined from Polypenco Nylon shapes can solve your maintenance problems. Here's why Polypenco Nylon shapes are today the best general purpose maintenance material:

- Close tolerance wear parts can be machined rapidly and inexpensively on standard metalworking tools.
- With Polypenco Nylon shapes available in rod, strip, tubular bar, slab, flexible tubing and hexagonal bar, fabrication is simplified.
- Polypenco Nylon shapes assure you highest quality nylon with uniform density, controlled physical properties and maximum dimensional stability.

Polypenco Nylon shapes are available for prompt delivery from warehouses in many principal cities. Send for copy of bulletins on Maintenance Applications and the Machining Characteristics of Nylon.

THE POLYMER CORPORATION OF PENNA., Reading, Penna.
In Canada: Polypenco, Inc., 2052 St. Catherine St., W., Montreal, P. Q.

POLYPENCO Nylon, Teflon*, Q-200.5 and K-51

*DU PONT TRADEMARK

For more facts circle 645 on Reply Card

tion has been given consideration in a paper by Ralph B. Wood, assistant chief engineer of Albany Felt Company. Whereas, John Bayuk, plant engineer of the Lycoming Div. of Avco Manufacturing Company has given attention to materials handling in his paper.

Corrosion Protection

INDUSTRIAL MAINTENANCE PAINTING by Paul E. Weaver. Size 8 by 5½ in. approx.; 82 pp including index; 1955 edition; illustrated; paper bound. Published by Paul E. Weaver, 4025 Brady Street, Baton Rouge, Louisiana. Price $3.00.

SELECTION AND application of coatings for the protection of metallic surfaces is covered in this book. The author has presented a discussion on various methods of surface preparation in the opening chapter that includes a table giving 8-hr cleaning rates, for steel surfaces, depending on varying conditions.

Under the topic of protective coatings, attention has been given to such items as vinyl, chlorinated rubber, neoprene, and epons. Fine points of spray gun usage are discussed and illustrated in the chapter on coating application. Other sections cover inspection, comparative costs, shop painting of steel, and steel design for painting. In the back of the book, there are a number of tables which should be useful for estimating and checking production.

Fire Protection

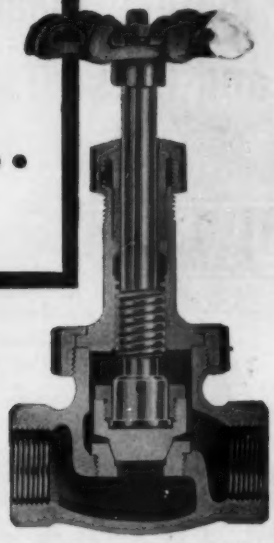
BUILDING CONSTRUCTION and Equipment. Size 8¾ by 5¾ in.; 672 pp; 1955 edition; cloth bound. Published by National Fire Protection Association, 60 Batterymarch St., Boston 10, Mass. Price $6.00.

SIX VOLUMES of National Fire Codes cover a wide range of interests. Of these, Volume III has been devoted to building construction and equipment. These codes are purely advisory as far as the Association is concerned. However, they have been adopted here and abroad as bases for sound practice.

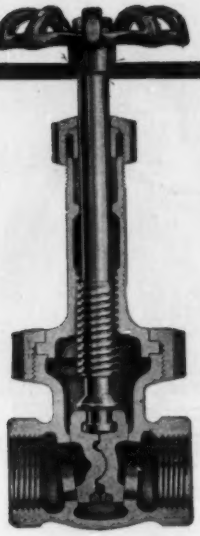
In this book, there are suggestions for the elimination of structural defects that influence spread of fire. Attention is given to specifications on chimneys serving industrial appliances, flues and metal smokestacks. Standards on industrial buildings included in this volume cover various types of construction involving reinforced concrete, heavy timber and steel.

Some of the other topics given attention in this publication are: roof coverings, protection of records, fire tests of building construction and materials, general storage and private residences.

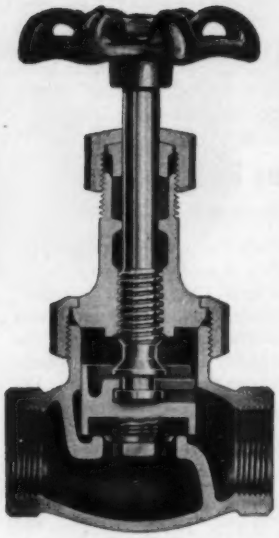
Walworth bronze valves...



Walworth No. 225P Globe Valve
500 Brinell Seat and Disc



Walworth
No. 29 Gate Valve



Walworth No. 95 Globe Valve
Re-New-Disc

built to give dependable trouble-free service on all recommended jobs

Walworth No. 95 Bronze Globe Valves (Angle Type: No. 96) are recommended for service where throttling is not required. They are rated at 150 psi working steam pressure, 500F; 300 psi cold water, oil or gas. The improved renewable disc and lock-on, slip-off disc holder — an original Walworth development—saves time and trouble. This valve can be repacked under pressure when fully opened. All parts are designed to give maximum service and strength.

Walworth No. 29 Bronze Gate Valves are rated at 200 psi working steam pressure, 550F; 400 psi cold water, oil and gas. These valves have rising stems and integral seats. Sizes 2-inch and smaller have union bonnets; sizes 2½ and 3-inch have bolted bonnets. Valves up to and including ¾-inch have solid wedge discs; 1-inch and larger have split wedge discs. These valves can be repacked under pressure when fully opened.

Walworth No. 225P Bronze Globe Valves (Angle Type: No. 227P) are rated at 350 psi working steam pressure, 550F; and 1000 psi non-shock service on cold water, oil and gas. The stainless steel, plug type seat and disc — heat treated to 500 Brinell — can be closed on sand, slag, scale and similar floatage, without injury to the seating surfaces. They are the longest wearing, TOUGHEST bronze valves you can buy.

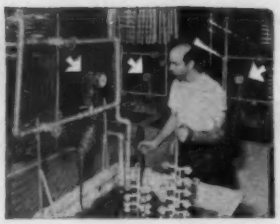
For full information about Walworth Quality Bronze Valves, see your Walworth distributor, or write:

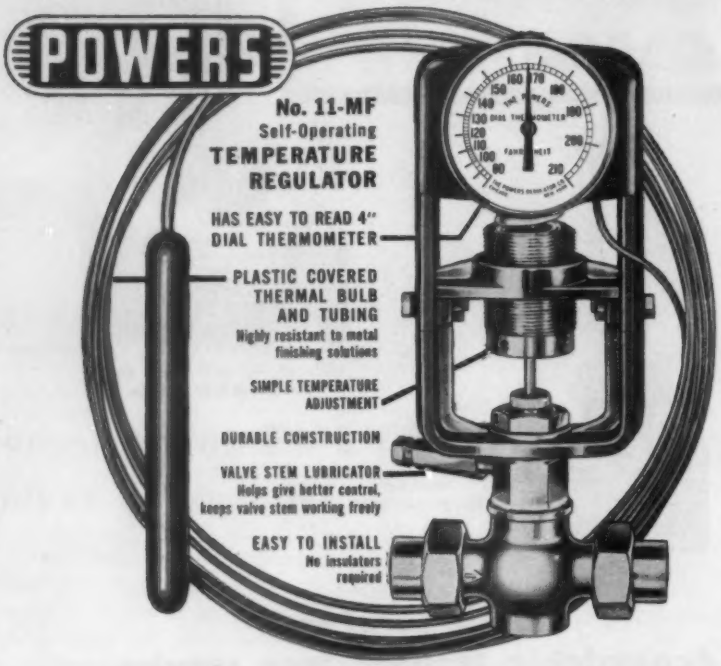
WALWORTH
valves and fittings

60 EAST 42nd STREET NEW YORK 17, N. Y.

For more facts circle 646 on Reply Card

For Plating, Cleaning and Rinse Tanks





Simplest, Most Reliable Control Made
Holds Temperature at the Right Point
Savings Often Repay Its Cost 3 to 6 Times a Year

Why Powers No. 11-MF Regulator Gives Better Control and Lasts Longer—better TEMPERATURE Control results from powerful bellows and minimum of valve stem friction. Valve Stem Lubricator aids easy movement of valve stem without binding. Double ply metal used in Powers bellows outlasts ordinary single ply type. Greater durability of plastic covered bulb and tubing also helps prolong the life of the regulator.

Dial Thermometer indicates temperature of solution under control. It gives a visual check of the process and makes it easy to adjust regulator for different temperatures.

Eliminate "the human element" in temperature control with Powers automatic Regulators. They're simple, compact and dependable. They stop OVER-heating, prevent "boil-overs," waste of steam, water wasted by evaporation, burnt plated parts, rejects, decomposition of costly additives and loss of volatile ingredients from cleaning solutions.

Powers Nationwide Service and 24 Hour Delivery in the U.S.A. are important time and money saving advantages. Order a Powers No. 11-MF Regulator now. Call your supply firm or write us direct for Bulletin 330 and prices. (c43)

THE POWERS REGULATOR COMPANY

SKOKIE, ILLINOIS | *Offices in chief cities in U.S.A., Canada and Mexico*

Over 60 years of Automatic Temperature and Humidity Control

For more facts circle 647 on Reply Card

Instrument Isolation

(Continued from page 138)

phases of industry. Vibration and noise transmitted from such equipment, unfortunately, often disturbs personnel since the equipment, due to its nature and function, is most likely to be located in or near otherwise quiet locations.

One such vibration and noise problem caused by computer operation occurred in one of the telephone company offices where a Remington-Rand Univac No. 120 was installed. The card puncher, the small unit at left in photo, was transmitting considerable vibration and noise to the offices directly beneath. The Univac itself, at the right in photo, also transmitted disturbances caused by the blower.

It was determined that spring isolators would do the best job of isolation. The equipment is now practically a steady static weight on the floor. Previously, the wide variations in bearing load had caused "walking" of the non-isolated machines.

Warehouse Racks

(Continued from page 115)

stored in bulk and where storage space is limited, a common problem today.

The General Chemical Division of Allied Chemical and Dye recently was able to increase by 40 per cent the storage capacity at its Baker & Adamson warehouse in Marcus Hook, Pa. This unique rack design permitted the elimination of every second aisle and utilized the space thus saved for storage. Four rows of racks were placed together instead of the usual two.

Access to the two inside rows was permitted by allowing the truck to enter the bays of the two outside rows to pick and fill the bays of the two inside rows. Entrance of the straddle trucks into the empty bays of the outside rows of racks is permitted by replacing the conventional stringer with a vertical T-bar assembly. By unblocking the bays on the aisle the inside rows can be reached directly and rows of racks can be placed together instead of the usual two.

Maintenance Standards

(Continued from page 119)

of the things which should be in our Standards Book rather than depending upon the memories of the engineers and designers. These books and drawings are used by the drafting room and shop. It is possible to go too far in referring to standards on drawings, for instance, stating that all piping

"You say I can see vibration, measure it, and eliminate it?"

1 "How much vibration do you think my machine has?"

No need to guess—the Veelos Vibration Analyzer shows exactly! This amazing electronic tester measures vibration amplitude down to *2-millionths of an inch*—tests one belt against another, actually shows which belt has "invisible shakes" . . . and how much! Don't guess about vibration; it's costing you hard cash every minute you ignore it. Ask your Veelos salesman to test your belts with the Vibration Analyzer.

2 "Isn't vibration caused by a number of things?"

Vibration can be caused by bearings, motor, clutch, sheaves or V-belts. Quite often it is caused by V-belts alone. The Veelos Vibration Analyzer uses a "strobe" light which "stops" the motion—shows exactly *what* is vibrating! It shows you precisely how much vibration you're paying for, and lets you correct it. The Vibration Analyzer gives positive proof, and the test takes only 15 minutes. It's free, of course.

3 "How do I eliminate costly belt vibration?"

Install Veelos, in place of ordinary V-belts! V-belts have spots of varying density, due to their construction, which throw them out of balance. Veelos belts are absolutely uniform; every stud and link is identical; *every foot of the reel* is identical and uniform; and they're perfectly balanced! Test any belt for vibration against Veelos—you're in for a shock. Your Veelos salesman will show you how to cut costs and improve your operation.

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VEELOS
THE BALANCED
LINK V-BELT

Veelos is known as Veelink outside U.S.A.

For free vibration analysis or Veelos Data Book write to:

MANHEIM
Manufacturing & Belting Company
204 Stiegel St., Manheim, Pa.

"Industrial Belt Specialists Since 1911"

Adjustable to any length • Adaptable to any drive • Balanced power • Constant power • Vibrationless power

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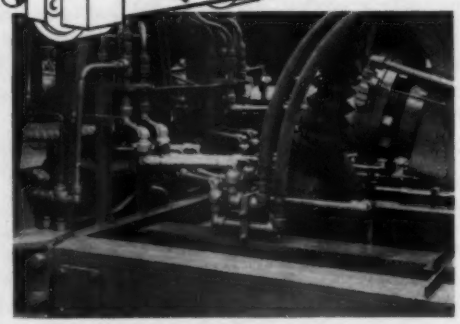
Works wonders with hydraulic lines

Chiksan Swivel Joints rotate full 360° in 1, 2 and 3 planes handling air, hydraulics, fuels, water, oil and other fluids.

CHIKSAN SWIVEL JOINTS

Give metal lines the flexibility of rubber with the safety and service life of steel. And with free swiveling 360° rotation, Chiksan Swivel Joints eliminate line failure due to bend radii and torsion fatigue.

Investigate Chiksan Swivel Joints for application in your plant and on your products. Their modest cost is quickly repaid in savings of down-time, replacements and maintenance.



Installed on hydraulic lines of a Salem-Brosius forging manipulator, these Chiksan Swivel Joints have been in continual service for over 3 years with no down-time to date.

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shown on the drawing is in accord with Standard 203-A-1. We have found that it is necessary to copy some of the information contained in the standards onto many drawings, as the pipefitters or mechanics do not have the Standards Book with them out on the job, but do have the drawings.

When a standard is to be added to the book or a major revision is to be made, the proposed new standard or change is tentatively made up and sent to the interested persons for review. Three or four days later a conference is called. These conferences usually include the chief engineer, plant engineer, the design group leader and area engineers who are particularly interested in the item under discussion. Also very important members of the conference are the shop and craft foremen who are working with these materials day in and day out. Quite often the actual field experience of the item, as observed by the foremen, is the deciding factor in product selection.

We have found the conference method the quickest and best way to establish a standard. The man preparing the standard leads the conference, explaining the need, reasons for the various selections, and usually has samples from suppliers to display. Previously, when we depended upon written replies, either we did not get the replies or the man in charge of the standards was called into the office of each member of supervision to explain the reason and need for the standards or the change. This was wasteful of the standard man's time, and we usually wound up in a conference before we could explain all the details to the various interested persons and obtain their approvals.

Our standard for valves provides a first and second choice. We spent considerable time on this standard as valves represent a large expenditure in both first cost and maintenance cost. We obtained quotations on comparable valves and a cost comparison was made. Using this cost comparison and evaluating our actual field experience with the different makes of valves, the selections were made. This standard was established many years ago and it was revised again last year. We were buying high priced valves for many uses, when cheaper valves which would give satisfactory service were stocked locally.

Another similar investigation was made on pipe unions. Again we changed manufacturers due to cost comparisons. The savings on the purchase price alone more than paid for the time of the man working on this Standards Book. These cost comparisons should be made at regular intervals to be sure that we are getting the most value for our money.

I would like to add a word of caution. It is impractical to change suppliers each time one of them announces a price change. This would defeat the whole idea of having standards. For instance, valves manufactured by various companies have different face-to-face dimensions. This makes replacement of one valve with a different manufacturer's valve very expensive. Also the more makes of valves which we have installed, the more money we must tie up in repair parts.

As an adjunct to our Standards Book we have a Stock Book which lists items carried in mechanical stores. This book is used by the designers so that they will select stock sizes rather than specify odd sizes not stocked. This is as important when building one-of-a-kind as when building several units.

We have a competent engineer who spends a good share of his time adding to and keeping our Standards Book up-to-date. There is no short cut to setting up standards for a Maintenance and Construction Engineering Department. The only way to establish and maintain this important aid is to pick

Are You Looking For This?
• New method of gravity flow and magnetic attraction.
• Smaller filter . . . greater flow capacity.
• Greatly increased magnetic attraction.
• 25-50% less floor space required.
• More complete filtration.
• Greater swarf load capacity.
• Reduced operating costs.
• Out-performs all present units.
Announcing the NEWEST, MOST EFFICIENT, MOST POWERFUL MAGNETIC . . .
Delpark's
Patents Pending
Combined Magnetic Separator and Filter
CONTINUOUS, FULL FLOW, SELF-CLEANING, FULLY AUTOMATIC FOR THE REMOVAL OF FERROUS SLUDGE AND ABRASIVES FROM COOLANTS
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BACKED BY MORE THAN 40 YEARS EXPERIENCE IN INDUSTRIAL FILTRATION
UNEQUALLED IN EFFICIENCY . . . gives filtration performance never before possible on production work. The only separator using gravity flow of liquids on top of the greatest magnetic power giving benefit of both gravity and magnetic separation. Reduced filter size . . . 25 to 50% LESS FLOOR SPACE REQUIRED.
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Here's How:

Brook has warehouses and distribution all over the world. Brook builds a. c. motors exclusively. As one of the oldest and largest motor manufacturers, Brook's production "know how" and volume result in motors built for a maximum service life at a lower cost.

WORLD'S MOST RESPECTED MOTOR

Get the facts—send for brochure!

Open Drip Proof (shown), Totally Enclosed Fan Cooled, Totally Enclosed Non-Ventilated, Single Phase, NEMA "C" Flange, Extended Shaft Pump Motors.

1 H.P. to 500 H.P.

FAST DELIVERY OF ALL POPULAR MODELS:

Brook Motors are available from warehouses at Chicago; Miami, Fla.; Jersey City, N. J.; Houston; Los Angeles; San Francisco; Seattle; Salt Lake City; Savannah, Georgia; and other major distributing points.

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BROOK MOTOR CORPORATION

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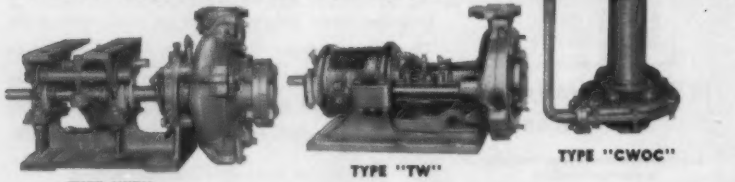
THIS USER GOT THEIR NAGLE PUMPS *free!*

A large plant using several types of Nagle Pumps theoretically got them free, based on the cost of the replacements and repairs of the ordinary pumps they were using. Since installing Nagle Pumps there have been no replacements or repairs.

Nagle Horizontal Shaft and Vertical Shaft Pumps are designed for the tough, abusive jobs where ordinary pumps fail—jobs involving abrasion, corrosion or hot liquids. Types and sizes for every need—if it is an abusive application. Send for Catalog 5206.



TYPE "KR" TYPE "TW" TYPE "CWOC"

NAGLE PUMPS

NAGLE PUMPS, INC.
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PUMPS FOR ABRASIVE AND CORROSIVE APPLICATIONS

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a top flight engineer who is familiar with the various phases of construction and maintenance, assign him to this job, and leave him on it. Setting up standards and keeping them up-to-date cannot be done economically or efficiently as a "fill-in" job.

Ladders and Ladder Safety

(Continued from page 106)

companies find it desirable to paint ladders and maintain them in a painted condition. Such painting is quite acceptable and permissible. It may serve to increase serviceability and reduce splintering, as well as to improve appearance. It is only to be recommended, however, after adequate initial inspection has been made.

Wood ladders should be stored in a well-ventilated place. They should not be stored near radiators, stoves, steam pipes, or other sources of excessive heat, or where they can get damp. They should be supported so that their weight is distributed to prevent sag. For example, if a long ladder is hung from two hooks near the ends, it will sag considerably at the center, and may in time become permanently deformed. Likewise, ladders carried on vehicles should be adequately supported to avoid sag and fastened to prevent damage in transport.

Regardless of how strong or how perfect a ladder may be, it may still be a hazard if not properly used. Habits are an important factor in governing what we do and how we do it. It therefore pays to cultivate safe habits in using ladders, based on a knowledge of ladders and their limitations, and involving the element of good judgment.

Wood ladders meeting the minimum requirements of the American Standard Safety Code for Portable Wood Ladders are designed to carry safely an assumed load of 200 lb, when the load is at the center of the rungs and at the center of the length of the ladder. Also in ladder design, the strength is calculated on the assumption that the ladder (single, extension, or section) will be used with the base moved out from the wall against which the upper end rests by a distance equal to one-fourth the length of the ladder. If the base is out further, the loading condition is more severe than that for which the ladder was designed. If the base is too near the wall, the ladder becomes less safe because it is more unstable.

Material of the minimum quality and sizes acceptable for ladders affords no large factor of safety that will permit gross misuse or overloading by a factor of 3 or 4. Thus single

"JOB-FITTED COMBINATION SCRUBBER-VAC

PUTS FLOOR-CLEANING ON PRODUCTION BASIS

—throughout our plant"

— *Says* Superintendent of Maintenance
VICTOR ADDING MACHINE COMPANY, CHICAGO

Victor Adding Machine Company insists on maximum production in floor-cleaning as well as in manufacturing. Like other *production-wise* industrial concerns, *Victor* cleans floors with a *Job-Fitted Combination Scrubber-Vac!* This single unit

Completely Mechanizes Scrubbing

—applies the cleanser, scrubs, flushes if required, and picks up (damp-dries the floor)—*all in one operation! Job-fitted* to specific needs, a *Scrubber-Vac* provides the maximum brush coverage consistent with the area and arrangement of the floors.

Model 213P, shown in illustrations at left, is designed for heavy duty scrubbing of large-area floors. It has a 26-inch brush spread, and cleans up to 8,750 sq. ft. per hour! *Finnell* makes still larger sizes—in *gasoline* as well as *electric* models—and also sizes for smaller operations. From this complete line, you can choose the *Scrubber-Vac* that will put *your* floor-cleaning on a production basis and reduce labor costs. And you can lease or purchase the machine. Maintenance men like the convenience of working with a *Scrubber-Vac*. This *all-in-one* unit is *self-propelled*, and has a *positive* clutch. There are no switches to set for *fast* or *slow*—slight pressure of the hand on clutch lever adjusts speed to desired rate. The powerful vac performs quietly.

In keeping with the *Finnell* policy of rendering an individualized service, *Finnell maintains a nation-wide staff of floor specialists and engineers. There's a Finnell man near you* to help solve your particular floor-maintenance problems . . . to train your operators in the proper use of *Finnell Job-Fitted Equipment* . . . and to make periodic check-ups. It's also good to know that *Finnell makes everything for floor care!* For demonstration, consultation, or literature, phone or write nearest *Finnell Branch* or Finnell System, Inc., 5304 East St., Elkhart, Ind. Branch Offices in all principal cities of the United States and Canada.

FINNELL SYSTEM, INC.
Originators of Power Scrubbing and Polishing Machines

Everything FINNELL for Floor Care

BRANCHES IN ALL PRINCIPAL CITIES

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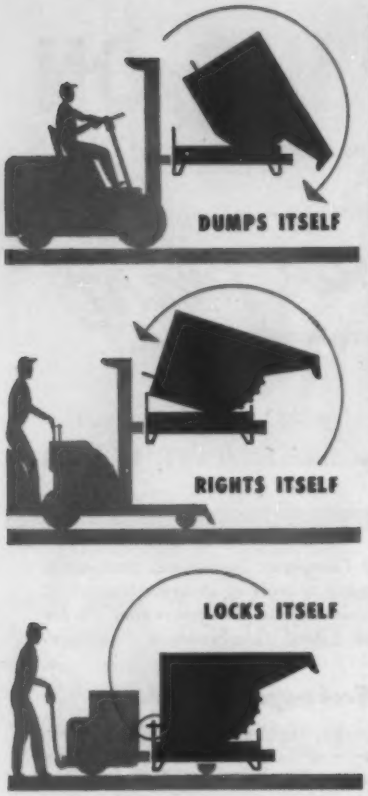

makes every truck a dump truck!

Fits securely on any standard fork or platform lift truck . . . can't slip off. Pick-up is quick and easy. Insures fast, efficient handling of any wet or dry, hot or cold bulk materials. *Cuts hand unloading by at least 50%* . . . with maximum safety.

This rugged Roura Self-Dumping Hopper is built like a battleship . . . extra heavy gauge welded construction . . . to withstand the terrific knocks and bangs of rough usage. Good for years of dependable service. Available in sizes from ½ to 2 cubic yards.

Thousands of these time-and-money-savers are now in use by America's biggest industries. Let us show you how they can help cut your costs, too.

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HERE . . . is the easy way to get full details about Roura Self-Dumping Hoppers. Just clip this coupon to your letterhead . . . sign your name . . . and mail to . . .

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220

of extension ladders are not designed to carry loads when stretched out full length horizontally over end supports. This is the function of scaffold ladders or scaffold planks.

Extension ladders are designed to be used with a specific minimum overlap between sections to insure proper strength. In choosing an extension ladder for a specific job, it should be remembered that the maximum working length is equal to the "size" of the ladder (the sum of the lengths of the sections) minus the overlap between sections.

The safety code for the construction, care, and use of ladders is based on minimum requirements that afford safety under average conditions of use. Where extra weight must be carried on ladders, or where there is continuous and extensive handling and hauling, it is desirable to use stronger ladders, which have rails of larger cross section than those built for ordinary use. Such heavy-duty ladders provide an extra margin of safety, but are, of course, somewhat heavier.

The design limitations also suggest caution in the use of ladder jacks and scaffold planks. The greater working space provided by the scaffold plank as compared to that of the ladder alone may invite loadings well beyond what the ladder is designed to carry. Care must be exercised to see that the total weight of men, scaffold, and materials does not overload one or both of the

supporting ladders, particularly if the majority of the load is near one end of the plank.

These considerations are the responsibility of the ladder user. It is accordingly important that he know the conditions of use for which the ladder is designed.

First and foremost in ladder use is to make sure the ladder is firmly and evenly supported, so that it does not rock or tilt, and will not slip. Special safety shoes are available for use with ladders supported on floors or surfaces that are inclined to be slippery.

Ladders should be faced when ascended or descended.

For other than short ladders, additional help is often needed for safe handling, particularly under unfavorable conditions, such as uneven footing, presence of ice or snow, or strong winds.

Care should be used also in the handling of ladders to see that they are not dropped or allowed to fall. Such rough handling may produce cross breaks or compression failures that seriously impair the strength of the side rails and that may lead to subsequent sudden failures and personal injury.

Ladders should not be used in a horizontal position as a platform, runway, or scaffold, nor for any purpose other than that for which they were designed. The common household step ladder, for example, is not intended for such industrial use as heavy maintenance work.

With the exception of special types, ladders are not designed to support more than one person or heavy objects. Carrying heavy objects on a ladder is even more critical when the weight is mostly on one side, so that the load is carried largely by one side rail.

Computers Rescue Maintenance

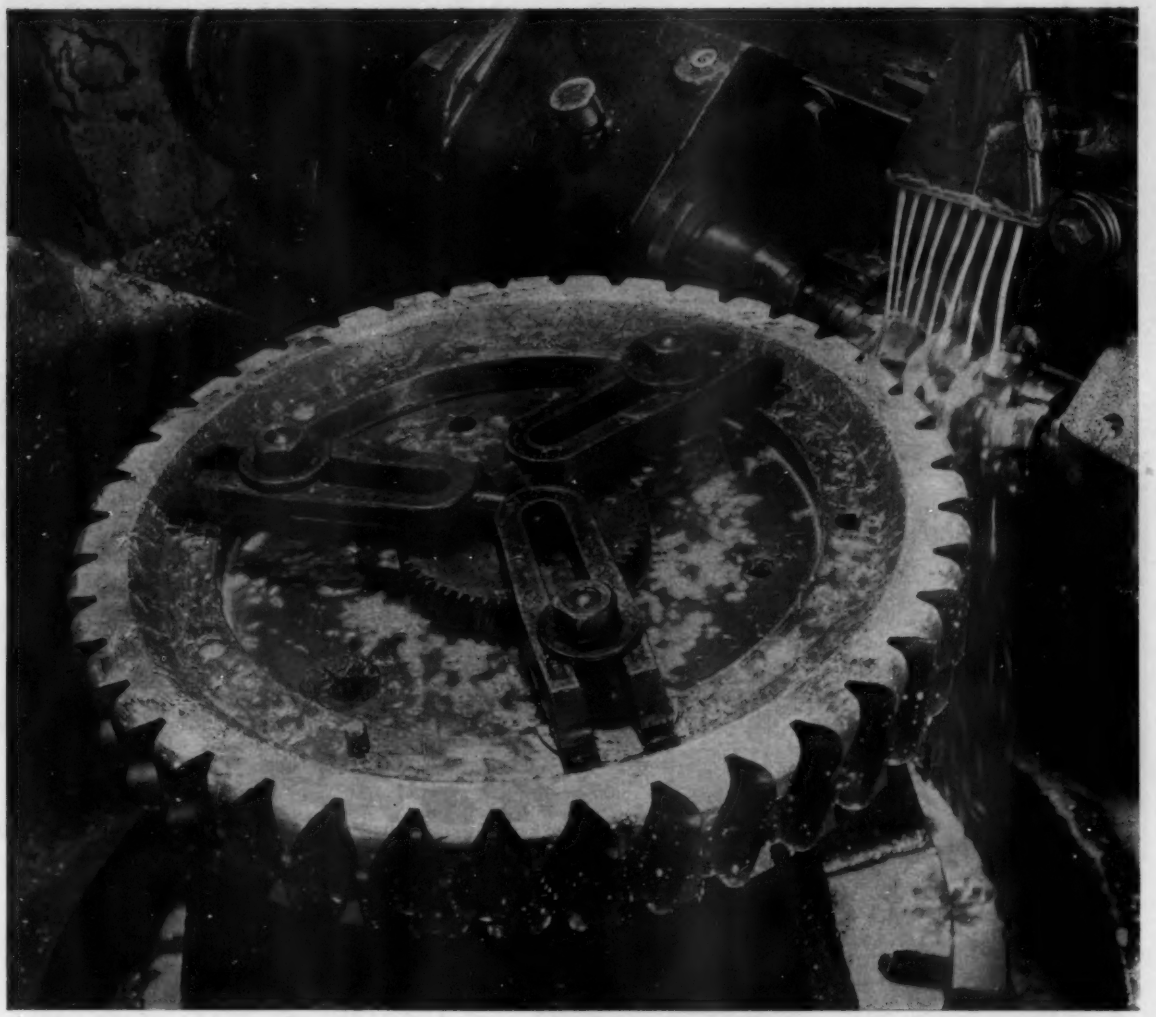
(Continued from page 92)

of machines and gauges due for "cycle testing". In all, some 8,000-10,000 Northrop machines require such checking. But rather than keep a many-drawered file, cards laboriously tagged for "test" dates, electronic computers, working 30 days ahead of due dates, supply the information to maintenance . . . all neatly bound.

Equipment Replacement: Here's another by-product of maintenance's original "Notice" form. Predicting future replacements has always been a man-sized maintenance headache. But not at Northrop. Annually, Data Processing sorts thru Plant Engineering's 90,000 card file, prints an equipment replacement list, charting every piece of equipment by its year of acquisition.

List in hand, maintainers decide on the basis of work experience, and upcoming contracts, the probable lifespan of every machine and tool. "Lifespan" information is repunched into the machine's master card. Yearly, plant engineering gets a list of machines due for replacement. Same list helps out when equipment, destined for loan or lease to a sub-contractor, must be prorated for rental . . . the rental figured over its remaining usable life.

What's Northrop's thesis for assigning electronic computers to maintenance's paperwork? First, that maintenance's function is impaired by a too heavy load of reports and inventories. Second, that a central bank of electronic machines can do more efficiently—and at less cost—what a corps



You can't do a quality job ...unless your coolant is clean

Abrasive dust in a machine tool's coolant seriously interferes with quality work and puts added wear on the coolant pump. Dirty coolants are particularly harmful in precision work. The only sure protection is effective filtration. It's also far more economical than repeatedly cleaning your equipment, and replacing the coolant. The finest filter available for this job is the Purolator Micronic® filter. Purolator's Micronic filters assure full protection for all kinds of work – and pumps – as no other filter does.

Purolator's Micronic element is made of plastic-impregnated cellulose. Its controlled porosity evenly filters out fine submicronic dust particles. It can't possibly channel, and it's in no way affected by high temperature, oil, or water.

Find out how Purolator Micronic filters can help you improve precision and cut down wear and tear on equipment by keeping coolants clean. Write for new Industrial Catalog to Purolator Products Inc., 970 Brunswick Ave., Rahway, N. J. Dept. P3-44.

PUROLATOR

"FIRST IN THE FIELD OF FILTERING"

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of clerks can accomplish, manually, in the plant engineer's office.

Says George W. Gillett, director of Northrop's Data Processing department, "We're working for the plant maintainer . . . taking the paper load off his shoulders."

How does Northrop decide what paperwork its computers should logically handle?

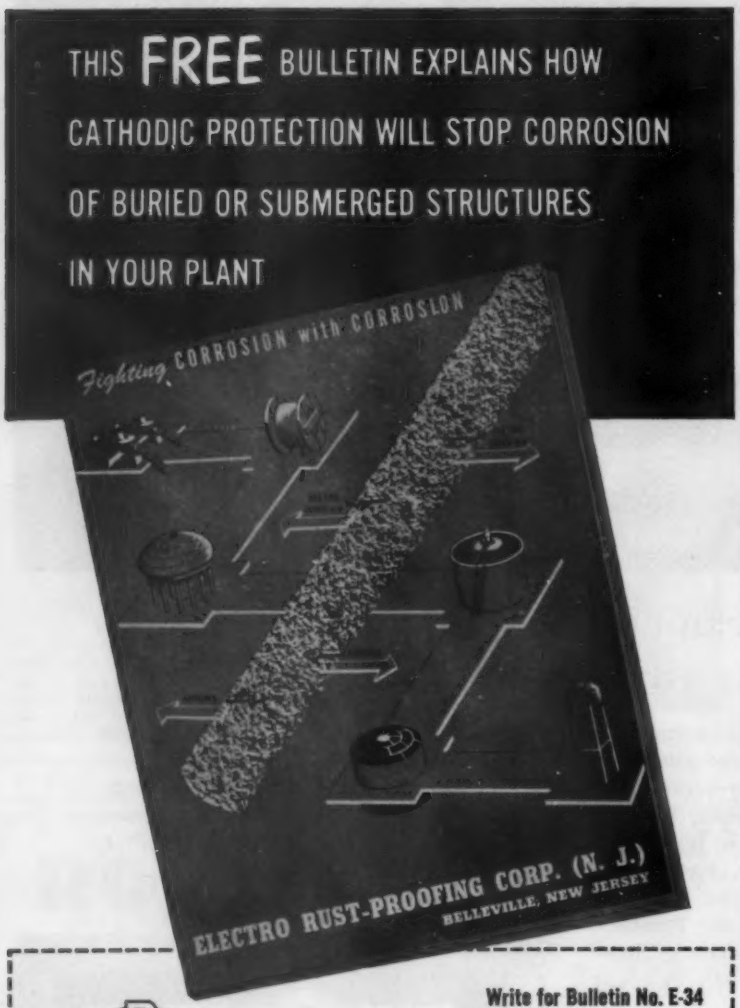
Such justification begins with Northrop's "Request for Tabulating Services" form. The form, in this case signed by the plant engineer, details a specific job, listing the hours required by more manual means. The request passes to a data processing analyst. His first job is to make sure the information sought isn't already available on punched-cards (often it is).

His second assignment is evaluation; will time saved processing the work on tab machines and the Univacs justify the cost? If electronic machines can work real savings, the analyst writes up the procedure. He specifies what machines are to handle the job, what cards are to be used, details step-by-step the tabulating method. Most important, he supervises the first run-through. After that, the tabulation becomes routine, its procedure standardized.

For Northrop's maintenance staff, directing operations in some half dozen plants and bases scattered from California to Florida, relief from the paper load is dramatic evidence of what statistical automation can do . . . for any plant engineering staff, anywhere. Only difference is that at most plants, statistical automation hasn't reached much farther down than the accounting department. Yet its most efficient use, believes Northrop's George Gillett, is as a functional tool of production, and that includes plant engineering.

"We look upon data processing," he says, "as just another production development . . . its statistics a vital subassembly of Northrop's "Snark" missile and the Scorpion F-89 twin-jet interceptor."

For Northrop's plant engineering department, statistical automation means something more: more time to do the things maintenance logically, theoretically and practically is supposed to do.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IN YOUR PLANT
Fighting CORROSION WITH CORROSLON
ELECTRO RUST-PROOFING CORP. (N. J.)
BELLEVILLE, NEW JERSEY

Write for Bulletin No. E-34

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ATLANTA CHICAGO DALLAS MONROVIA SEATTLE

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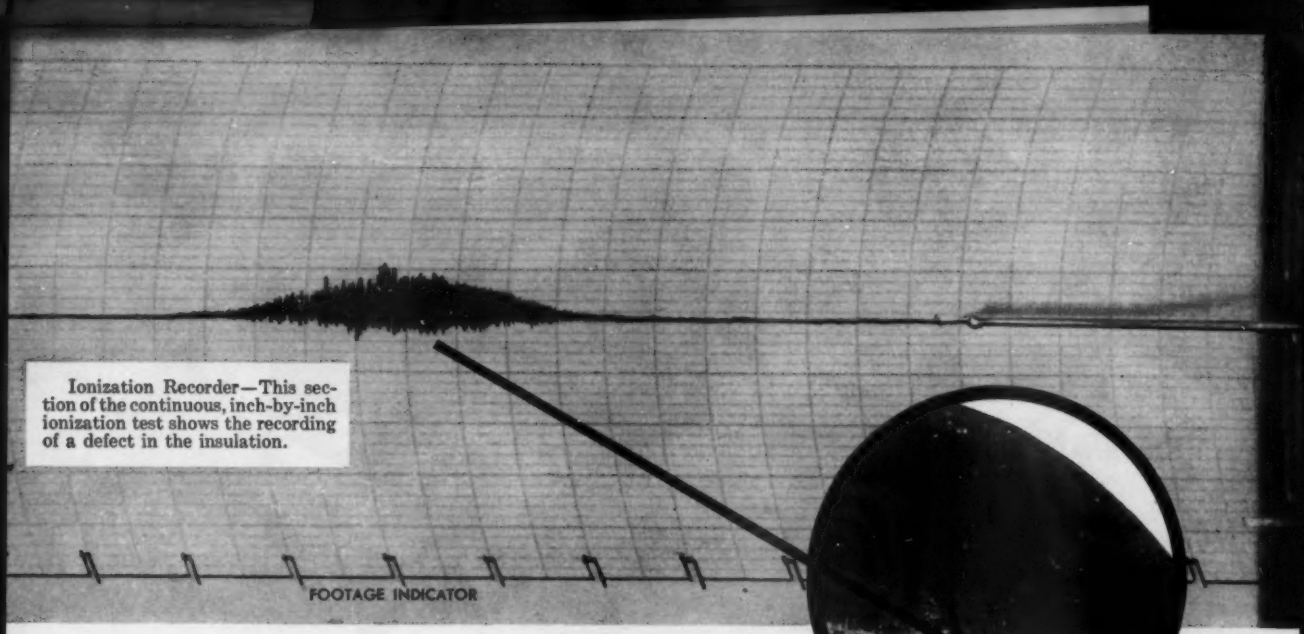
Noise Reduction

(Continued from page 96)

meaning. Most of the psychological tests on loudness at lower noise levels, however, indicate that, for high frequencies, a reduction in noise level of about 9 db corresponds to a loudness change of about 2 to 1. If extrapolation to higher noise levels is valid, this would indicate that the complete booths give loudness reductions in adjoining booths of the order of 4 to 1 and loudness reductions at locations in front of the booths of approximately 2 to 1.

Quantitative information on the performance of noise control installations is extremely valuable to the acoustical engineer and studies of the type which have been discussed are helpful in improving performance of future designs. It is often difficult, however, to explain the significance of such measurements to plant personnel who may not have extensive background experience with noise control.

If, on the other hand, the installation is effective, listening tests and comments from personnel who work continuously in the noise area will usually provide adequate evaluation of the device. In one case of an industrial noise control installation, a foreman who had reported favorably on its performance was asked on what he based his opinion. His reply was: "Before the job was done the whole place was noisy. Now the noise that belongs over there stays over there."



Ionization Recorder—This section of the continuous, inch-by-inch ionization test shows the recording of a defect in the insulation.

This void was detected by the "Gooding Test Train" ionization test. It was *not* detected by any of the industry's standard test procedures.

New Testing Procedure developed by Okonite

"Gooding Test Train" detects flaws in insulated power cable (4kv and over) heretofore unrevealed by standard tests

The "Gooding Test Train" has significant value to cable users. This new system of *non-destructive* testing, developed and used only by Okonite, reveals imperfections which are frequently not detected by ordinary testing procedures. Some of them even slip by Okonite's super-voltage a-c and d-c tests (highest used in the industry) and "full reel" corona tests.

The "Gooding Test Train" consists of a series of three test sets. The entire length of cable passes consecutively through each set as follows:

SCHEMATIC DRAWING OF GOODING TEST TRAIN

1. Uniformity Test—A uniformity gauge continuously checks insulation thickness—locating any thin spots which might cause premature failure.

2. Ionization Test—This is the most important unit of the "Gooding Test Train". It can measure the corona level at any spot along the cable. Procedure is to test the cable *inch-by-inch* at a predetermined voltage which is sufficient to assure the user that the corona level is at least 1½ times the rated voltage. Voids and imperfections as small as a grain of sand have thus been identified and removed.

3. X-Ray Test—X-ray inspection of the cable is performed by a 250,000 volt X-ray machine. This determines the nature and extent of any of the flaws indicated above.

By such intensive testing, it is possible to eliminate previously unidentified imperfections that might otherwise lead to premature failure. Studies of such defects also help to identify the cause and permit preventive measures. The "Gooding Test Train" is now being used to test all Okonite's rubber-insulated cables rated at more than 4000 volts. It is a long step towards securing the "perfect cable" and, as such, of tremendous benefit to cable users.

For detailed information about Okonite's G.T.T. write for new Bulletin PE-1100, to The Okonite Company, Passaic, N. J.

3804

OKONITE insulated cables

SINCE 1878

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FAST

is the word for these efficient little

RIDGID

Drop-Head Dies!

Easy threading of ⅛" to 2" pipe or conduit

Snap size head you want into ratchet drive ring, from either side—it can't fall out. Dies reverse easily for close-to-wall threading. 00R and 0R, ⅛" to 1"; 111R and 11R, ⅛" to 1¼"; 12R, ⅛" to 2". Free carrier with sets. Conduit and special dies available. Real work-savers—at your Supply House!

RIDGID Bolt Threaders, too—No. 00R-B, ¼" to 1", National coarse and fine thread, efficient drop-head dies.

"Threaded Pipe—It's Tight—It's Best—Costs Less"

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Work-Saver Pipe Tools

The Ridge Tool Company, Elyria, Ohio, U. S. A.

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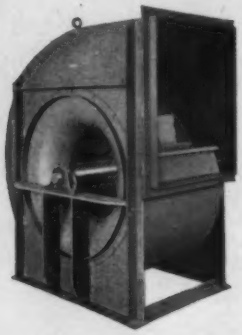

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Skillfully Engineered, Accurately Rated
Feature Heavy Welded, Steel Construction

Two types of fan wheels. Housing dimensions remain the same but performance characteristics differ.

Forward Curve wheels offered from 7½ to 73 inch. Capacities up to 70,000 cfm.

Quiet operating, medium speed (IPL) wheels with non-overloading horsepower characteristics for heating, ventilating and air conditioning or industrial applications. Wheel diameters from 15 inch to 73 inch, with any speed or discharge required. Capacities up to 123,00 cfm. Class I, II, or III construction.

All-welded housing featured as standard construction for simplicity, extra strength and rigidity—dust tight and leak proof. Bolted (knock-down) type available in Class I and Class II. Split housing can be furnished as extra if required.

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BULLETINS

(Begins on page 25)

160 Refrigerating Machine—Eight-pp Bulletin 1426 describes the Tonrac single-stage hermetic contrifugal refrigerating machine. A cutaway photo illustrates various construction details, including condenser, single-stage compressor, motor and purge system. Photos of a typical installation are included, and related refrigerating and air conditioning equipment are listed. American Blower Corp.

161 Cooling Units— Bulletin C-1100-S105 describes company's Flexi-Cool units which are factory assembled for a wide variety of air conditioning applications. Illustrates ways in which Flexi-Cool can be arranged, and shows relative positions of basic components—cooling cycle, blower, filter, and plenum sections—as well as giving piping and duct sizes. Worthington Corp.

162 For Cooling, Condensing—Various types of units used to build cooling and condensing systems for process fluids are described and illustrated in 24-pp Catalog HT-23. Includes data on use of sections in refineries, by-product plants, and in gas, chemical, steam or diesel power, heat treating and wood preserving plants. Among subjects covered are design features, physical characteristics, and types of installation. Thermal design of a cooler or condenser, calculations for an evaporative cooler are presented. Fittings, water distribution accessories, and hints on installation are also covered. Heat Transfer Div., National-U. S. Radiator Corp.

163 After Cooler—Bulletin 130, 8 pp, explains functions of company's Aero after cooler in removing moisture from compressed air and gas. The apparatus is described and illustrated with diagrams and photos. Included also are diagrams and illustrations of applications in liquefication systems. Bulletin also illustrates other types of air engineering equipment produced by manufacturer. Niagara Blower Co.

164 Cooling Tower—Construction and operational details of an induced draft cooling tower are described in Bulletin CT-56-1. Provides a three-dimensional drawing of a tower cell, also perspective drawings of major equipment features, including water-mixer drift eliminators, cone spray nozzles, bracing and anchoring system. Foster Wheeler Corp.

165 On Heat Exchanger Design—Bulletin PE-33 is a 16-pp design manual for Pyrex brand modular glass shell and tube heat exchangers. Edge-indexed for convenience, this manual offers help in choosing the right module for a heat exchange system. Ten engineering drawings show how company's heat exchanger modules can be installed. Engineering data for determining capacity requirements of the 50 sq-ft and 13½ sq-ft capacity heat exchanger systems include charts and information on fluid constants, friction losses, surface area calculations. Corning Glass Works.

ELECTRICAL

166 Substations For Light Load Areas—Bulletin 11B7895A, 8 pp, describes standardized and package substations for light load areas. Lists material furnished for high and low voltage structures and diagrams optional arrangements for each. Allis-Chalmers Mfg. Co.

168 Feeder Busway—A low-impedance feeder busway system for general-purpose power distribution applications where heavy loads are served or low-voltage drop is essential is described in 16-pp Bulletin GEA-6151. Covers construction and application of company's enclosed bus-bar system. Also lists ratings, weights, dimensions, installation data, and guide form specifications. General Electric Co.

169 Power Supplies — Condensed standard specifications on a wide range of power supplies, voltage regulators, voltage reference sources, frequency changers, etc., are provided in this 1956 catalog. Included are data on regulation accuracy, input and output voltages, ripple, recovery time, load range. Also listed are local technical representatives and service facilities. Sorensen and Co., Inc.

170 Gear Motors—Eight-pp Bulletin E-2408 describes a new line of gear motors incorporating new NEMA motors and redesigned gearheads. Presents examples of the types, mountings, enclosures, and ratios available. A cutaway view points out extra features and engineering design details. Also discusses and illustrates the simplified maintenance possible. A section on selection explains how the unit type construction permits selection of gear motors to meet specific requirements. Reliance Electric & Engineering Co.

171 Flat-Plate Batteries—Exide Powerclad batteries are described in this folder. A cutaway drawing shows details of construction of the positive plate, including the corrosion-resistant Silvium grid. Also shown in detail is the polyethylene insulator which reinforces the Vitrex retainer and forms a continuous wrap around the bottom of the plate. The Electric Storage Battery Co.

172 Electrical Specialties — Technical and descriptive data on Levolier line of electrical specialties are contained in 52-pp Catalog 84. Items covered include switches of all types in ratings from 0.75 to 20 amp; brass and phenolic lampholders; industrial lamp guards; service lights in a wide variety of styles; and miscellaneous parts and accessories. Descriptions on each unit cover recommended uses, advantages and method of operation. Large photos show features and, where pertinent, schematic wiring diagrams are included to show different switching arrangements available. McGill Mfg. Co., Inc.

173 Machine Tool Limit Switch — Seven models and 19 contact arrangements of Loxswitch heavy duty limit switches are described in 12-pp Catalog 955. Purchasing and specification data on each switch is given, including information on housings, wiring diagrams, ampere ratings, operating data and electrical characteristics. Cutaway view illustrates important features. R. B. Denison Mfg. Co.

SUGGESTED REFERENCES on V-belt drives . . . speed reducers . . . shafting . . . other power transmission equipment

175 Multiple V-Belt Drives—Origin and development of the multiple V-belt drive is discussed in 36-pp pocket size Bulletin 20E8297. Also covers evolution of standards in engineering V-belt drives, tells how to engineer a V-belt drive, provides tables and data, and describes modifications in V-belt drives. Answers to questions relating to basic principles and practices involved in engineering and use of V-belt drives are provided. Allis-Chalmers Mfg. Co.

176 Shaft-Mounted Reducers — Details on Cone-Drive line of shaft mounted speed reducers are presented in 12-pp Bulletin CD-400. These reducers utilize double-enveloping worm gear design and are claimed to provide greater load-carrying capacity, size for size, than possible with many right-angle reducers. Dimensioned assembly drawings, horsepower and torque rating charts, and application photos illustrate booklet. Specifications on bore sizes and gear mountings, plus mounting instructions are included. Cone-Drive Gears Div., Michigan Tool Co.

177 V-S Transmissions — Infinitely-variable speed transmissions are generously illustrated and concisely described in 28-pp Catalog 65. Construction, accessories, and controls, both manual and automatic, are classified. An engineering section indexes and tabulates power transmission characteristics, ratings and dimensions. Ordering specifications included. Lewellen Mfg. Co.

178 On Flexible Shafting — Described and illustrated in this 20-pp booklet are flexible shafting, flexible housing and tubing, and flexible shaft assemblies. Construction advantages, characteristics and selection and application information are provided. Includes inch-pound torque transmission tables, other engineering data. Several pages are devoted to typical flexible shaft assemblies. Walker-Turner Co., Inc.

On the facing page are two postage-free Reader Service Cards provided for your convenience in ordering these bulletins. You may also use the cards to order any literature mentioned in ads.

METALS

179 The Special Steels—Sixteen-pp "Special Steels for Industry" gives details as to stainless steels, electrical materials. Carmet carbide materials, and tool steels. Numerous charts giving analysis of various steels as well as detailed information on fabrication and properties are included in this reference booklet. Allegheny Ludlum Steel Corp.

180 Stainless Tubing, Pipe—Technical Data Card 162A covers welding characteristics of both austenitic and ferritic types of stainless steels and briefly describes welding methods and techniques. Also included is a table indicating electrodes, preheating and post welding heat treatments to be used in joining the stainless steels to each other and to carbon, carbon molybdenum and chromium molybdenum alloy steels by the arc welding method. Tubular Products Div., The Babcock & Wilcox Co.

PLASTICS, SYNTHETICS

181 Plastic Tubes, Rods, Sheets—Included in this 52-pp catalog and price list are data on thermoplastic and phenolic sheets, rods, tubes and films. Miscellaneous resins, cements and supplies are also listed. Provides comparison table of chemical, electrical and mechanical properties, and lists available sizes, weights, color ranges, specifications. Information presented enables easy price and properties comparison of acrylic, vinyl acetate, polyethylene, polystyrene, nylon, Teflon, and Kel-F plastics in cast and extruded shapes. Catalog is thumb-indexed for quick reference. Cadillac Plastic and Chemical Co.

182 Chemical Resistance Chart—What is announced as the most comprehensive list showing compatibility of reagents to such thermoplastic materials as polyethylene, non-plasticized PVC, high impact PVC, and high-tensile high-temperature polyethylene is presented in chart form in this 10-pp booklet. Nearly 400 reagents are included together with indicated concentrations and corresponding information keyed to show "satisfactory," "some attack," or "unsatisfactory" according to the four types. American Agile Corp.

183 On PVC Linings—How to choose best polyvinyl chloride protection for any given corrosive environment is discussed in this bulletin. Three commonly used types are covered individually, as to characteristics, advantages and disadvantages, and best applications. Space is also devoted to flexible-rigid PVC laminates. Kaykor Industries, Inc.

184 On Chemical Rubber—How to obtain rubber products with greater resistance to deterioration is discussed in this 8-pp booklet. Tells how Hypalon chemical rubber solves problems in product design and plant maintenance. Touches on composition and manufacture of this versatile synthetic; outlines characteristics that assure good performance under severe service conditions; and shows by example how these properties prove advantageous to users of hose, belting, seals, coatings. No technical data is included, since book is not intended as a working tool for rubber technologists. Elastomers Div., E. I. du Pont de Nemours & Co.

METAL FINISHING

186 Potassium Cyanide Solution—Bulletin C-6-227 describes company's potassium cyanide solution for use in electroplating applications, stressing its economy, purity, ease of handling, safety, and quality control. Lists applications in plating of automotive parts, appliances, silverware, surgical instruments, hardware, tools, and ball bearings, and certain custom plating operations. Chemical Div., Koppers Co., Inc.

BULLETINS

(Begins on page 25)

188 **To Strip Reclaimed Parts**—Removal of stubborn paint and phosphate deposits with Rustripper is described in this revised folder. Shows how use of this alkaline rust, paint, and other scale remover can eliminate separate rinsing, pickling and neutralizing operations on rejects, products rusted during production, and used products to be reconditioned. Oakite Products, Inc.

189 **Cutting, Coloring Buffs**—Bulletin B-103, 12 pp, describes three types of buffs used in cutting down and coloring: pieced buffs, used for lighter work; full-disc buffs, for medium to light duty; and Ruff-L-Buffs, for heavy duty. Advantages of Binderized buffs are shown and methods of sewing buffs are explained. Hanson-Van Winkle-Munning Co.

OTHER EQUIPMENT

190 **Pipe Insulation** — This 12-pp booklet gives information on Thermobestos pipe and block insulation for hot outdoor piping and process equipment operating at service temperatures to 1200 F. Explains why this hydrous calcium silicate insulation has exceptional strength and extreme lightness; is chemically stable and non-flammable; has low conductivity and is not damaged by water. Sections of booklet are devoted to prefabrication of fittings, physical and thermal properties and tables of sizes and thicknesses. Johns-Manville.

191 **Barometric Condensers**—Twelve-pp Bulletin 5AA describes barometric condensers for removing air, exhaust steam, and other vapors from vacuum equipment. Covers condenser theory, basic condenser types, features, application and construction information, and condenser operation. Also included is information on selecting condensers under varying conditions. Tables giving capacities, dimensions, and weights. Schutte and Koerting Co.

192 **Heavy Duty Fans**—Bulletin DS-348-C, 28 pp, describes a line of heavy duty fans for high velocity air conditioning and industrial process applications. Includes fan selection data, capacity tables, roughing-in-dimensions, as well as photos and drawings showing design features and operation. The Trane Co.

193 **Automatic Lubricators** — Bulletin 3A describes and illustrates high-pressure automatic lubricators applicable to machine tools, packaging, bottling machines, others. They deliver metered quantities of oil on adjustable time cycles, and bulletin describes the cam mechanism controlling this cycling. Basic types for frequent and infrequent cycling are discussed in terms of feed requirements for specific machines. Bijur Lubricating Corp.

194 **Ceiling Diffusers**—Catalog F 7722 features design and application data on the Model BP Venturi-Flo Diffuser. Includes performance data as well as information concerning physical characteristics of the unit. Barber-Colman Co.

196 **Molybdenum Silicide Data**—Two companion publications on molybdenum silicides are 8-pp Bulletin Cdb-6 on refractory molybdenum silicides, and Bulletin CH-23 on fabrication of molybdenum disilicide parts. In the former, information on various molybdenum silicides is consolidated from 52 sources. Treats preparation, applications, and properties of this new class of refractory compounds. In addition, multisilicide systems are covered. In the bulletin on fabrication, the techniques used to make molybdenum disilicide parts are detailed. Climax Molybdenum Co.

197 **Hydraulic Machinery**—Included in 24-pp Bulletin 110-D is detailed information on manufacturer's line of machinery. Covers injection, compression, and transfer molding machines for the plastics industry; extrusion presses for ferrous and non-ferrous metals; metal-working equipment; railroad shop equipment; standard and special machinery for general industrial applications. Watson-Stillman Press Div., Farrel-Birmingham Co., Inc.

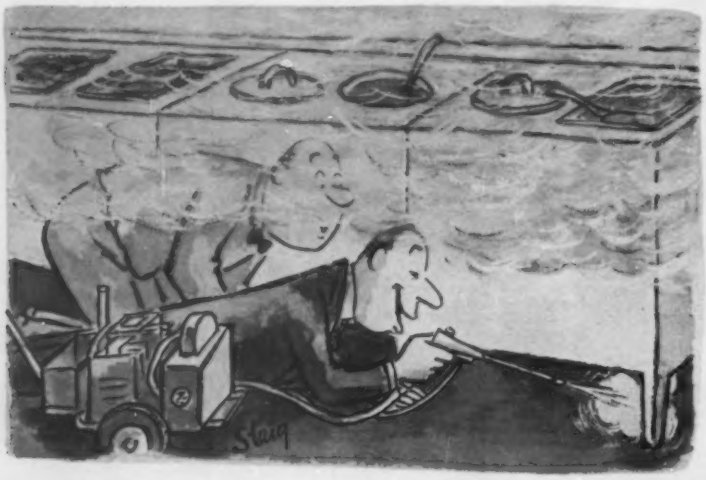
198 **Solvent, Air Recovery**—A survey of solvent and air recovery by means of activated charcoal is given in Technical Bulletin W-356, 10 pp. Covers theory and history of solvent and air recovery, and details advantages and circumstances under which such systems may prove advisable from such standpoints as economy, safety, improved working conditions, pollution elimination. Also treats estimated costs and efficiencies of recovery systems, for solvents, system selection. Barnebey-Cheney Co.

199 **Packaged Steam Generators** — Bulletin MH 3-54, 14 pp, gives detailed coverage to company's Type MH packaged water tube steam generators which are furnished for oil or gas firing or both, with automatic, semi-automatic, or manual controls. Included are: cutaway illustrations, installation photos, tube arrangement layouts, a photo-sequence story of actual shop assembly. Union Iron Works.

200 **Miniaturization**—Thanks to the vanishing cube—a helpful design concept presented in 22-pp Form 2132 on miniaturization—seemingly minor reductions in the dimensions of a product can produce dramatic savings in weight and volume. Illustrated with charts and photos, booklet shows importance of precise information on loads and on ability of structural parts to sustain these loads as a prerequisite to using smallest possible parts. Discusses mathematics of miniaturization, effects of temperature, higher pressure and rotational speed. Standard Pressed Steel Co.

201 **For Metal Casting**—How "dag" colloidal dispersions can help increase production, cut costs and improve quality of various casting operations is told in Bulletin 425. Details techniques for use with different "dag" dispersions to coat permanent molds, steel and cast-iron chills, die cavities, others. Prescribes formulas for achieving high lubricity and wetting action, heat resistance, easy parting, other qualities. Acheson Colloids Co.

202 **Permanent Magnet Manual**—Permanent magnet materials and their selection is the subject of 12-pp Manual 5-R. A selector-type chart summarizes magnetic characteristics, application and design factors, material characteristics, manufacturing methods and shapes limitations. Also discusses hysteresis loop and demagnetization curve, temperature limitations, directional properties, incremental permeability and hysteresis loss. A glossary of magnetic terms, listing of magnetic symbols included. The Indiana Steel Products Co.



"Insects can't escape SUPER MIST-O-RIZER's *fog or spray!"*

No remote crack, crevice or hiding place is inaccessible.

WEST's portable SUPER MIST-O-RIZER goes everywhere! It either fogs or sprays VAPOSECTOR, WEST's highly concentrated insecticide. Coverage is amazing.

In fogging, one three gallon filling with VAPOSECTOR controls:

— flying insects in 400,000 cu. ft. of space.

— crawling insects in 200,000 cu. ft. of space.

No waste! WEST's SUPER MIST-O-RIZER atomizes VAPOSECTOR into uniform 8 micron-sized particles. Creates a "dry mist" that doesn't wet or condense on surfaces.

And in contact spraying, 12 feet of air hose attached to the hand sprayer provide easy access to hard-to-reach areas.

LET a WEST Specialist demonstrate the insect killing power of SUPER MIST-O-RIZER and VAPOSECTOR which is safe to use as directed around foodstuffs. Or ask about our complete program of insect control, including everything from tailormade permanent installations to small hand operated units. Just write, or call your local WEST office.

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A Private FIRE Protection System...

that reduces insurance rates

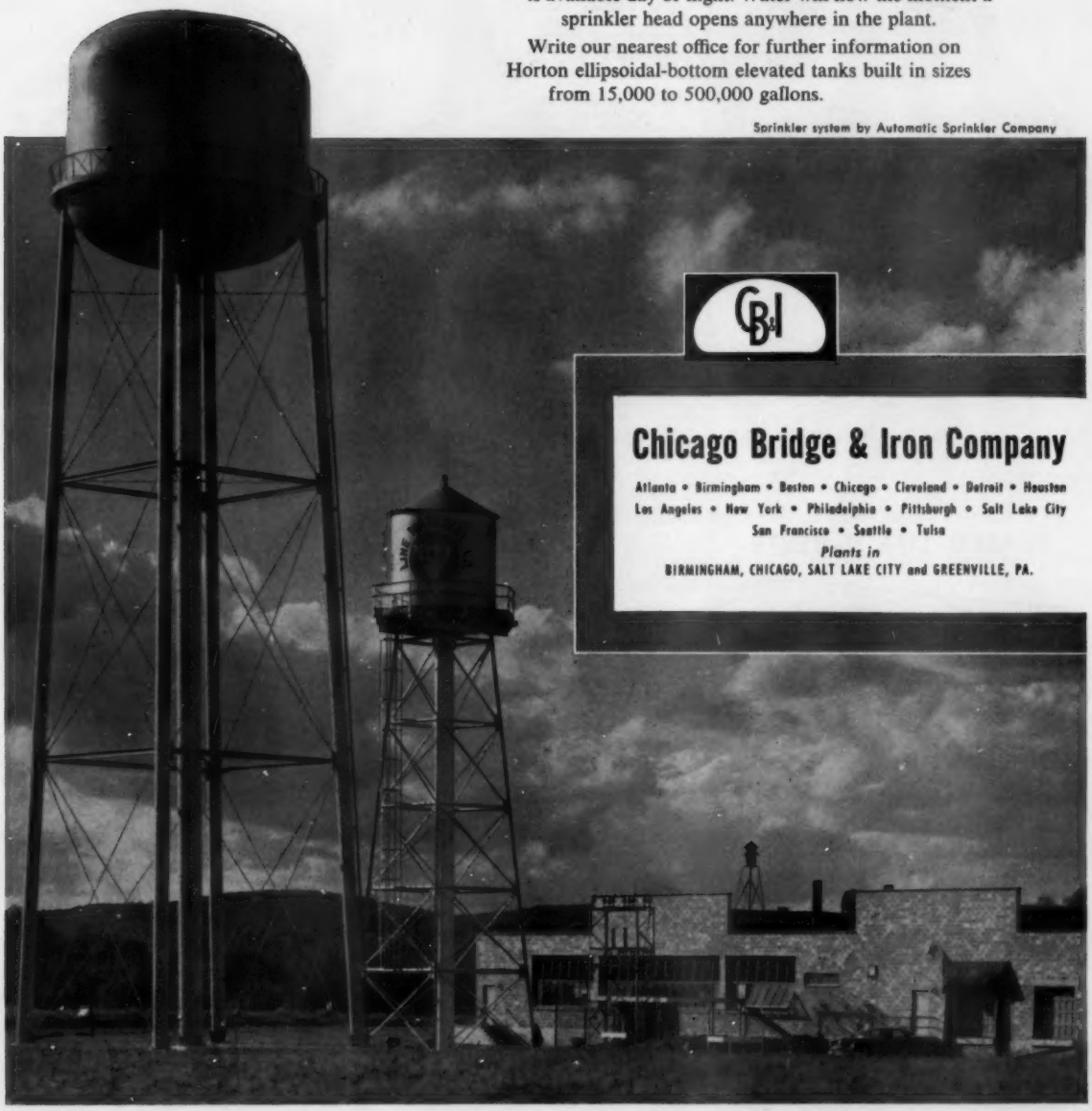
$5,000 yearly!

As a result of greater fire protection provided by a Horton® elevated tank and an 842 head sprinkler system, savings of $5,000 yearly from lower insurance rates are being realized by Line Material Company at its Olean, N. Y. plant.

The Horton elevated tank, shown in the foreground, provides a dependable gravity pressure water storage that is available day or night. Water will flow the moment a sprinkler head opens anywhere in the plant.

Write our nearest office for further information on Horton ellipsoidal-bottom elevated tanks built in sizes from 15,000 to 500,000 gallons.

Sprinkler system by Automatic Sprinkler Company



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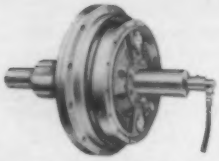

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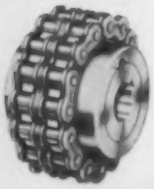

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SEALED-LIFE V-BELTS

DODGE BULLETINS YOU SHOULD HAVE

- ✓ Air-Grip Clutches. Technical data, sizes and selection tables. Bulletin A634
- ✓ Chain Couplings, Taper-Lock Sprockets and Dodge Roller Chains. Technical data and selection methods. Bulletin A644
- ✓ Sealed-Life V-Belts. Construction details and complete data on sizes, pitch lengths and outside lengths. Bulletin A606

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DATA FILE of literature for the plant engineer's library

STANDARD CATALOGS, bulletins and handbooks are listed to help plant engineers maintain a permanent data file. To get these free catalogs, circle item numbers of those wanted on postage-free cards provided for you on pages 225-226.

PUMPS, COMPRESSORS

301 For Hazardous Liquids—Catalog Section D, 12 pp, presents company's line of Underwriter rotary pumps for hazardous liquids. Both mechanical seal and deep stuffing box models are shown and dimensions and specifications provided. Various mounting arrangements and drives available for these UL approved pumps are also cataloged, and application suggestions are given. Also in this booklet are performance graphs. Viking Pump Co.

302 Condensation Pumps—Eight-pp Bulletin 1403 describes company's line of condensation pumps for use in low and medium pressure-heating systems and steam-process equipment. Photos, drawings and other technical data on capacities and dimensions pertaining to construction, application and installation are included. C. A. Dunham Co.

303 Continuous Flow Pump—Bulletin 30-C, 8-pp, outlines advantages of company's Moyno pumps which handle a variety of materials—from free-flowing liquids to non-pourable pastes, abrasives, solids. Describes principle of operation, discusses performance, construction, capacities, and includes photos, diagrams and specifications. Robbins & Myers, Inc.

304 Steam Pump—Bulletin 230 describes a horizontal duplex steam pump with piston valve steam chest. Explains advantages of this construction, including high recovery of fuel cost when exhaust steam is utilized. Provides sectional and exterior views of the pump, also specifications, capacities and dimensions. Warren Steam Pump Co., Inc.

305 Data on Pumps—This 12-pp condensed catalog covers turbine-type and centrifugal pumps for a wide range of industrial uses. Gives construction specifications, capacities, application information as well as reference to specific literature on each type. Fully illustrated. Also includes data on mixed flow pumps, sump pumps. Aurora Pump Co.

306 Condensed Pump Data—Form 4383-J covers more than 20 types of general service pumps, rotary pumps, sump and drainage pumps, condensate units, self-priming units, stainless steel pumps and high-pressure pumps. In easy-to-find tabular form, each model is pictured along with its characteristics, applications and features. Goulds Pumps, Inc.

307 Sump Pump Selector — Bulletin 54-3-1420, 20 pp, provides a selection table allowing a plant engineer to choose any of the 4000 models of the BJ Sumpmaster pumps, which range from 10 to 2600 GPM with heads from 20 to 300 ft. Includes complete dimensions and outline drawings. Byron Jackson Co.

308 High Vacuum Pumps — Catalog 400 describes company's mechanical booster high vacuum pumps. Points out advantages of two-stage construction, and illustrates characteristics in metallurgical vacuum processing, metallized coating, foundry research and pharmaceutical applications. A cutaway view is included, together with performance curves which show typical pumping speed, other data, horsepower vs. inlet pressure. Kinney Mfg. Div., The New York Air Brake Co.

309 For Abusive Pumping Jobs — Catalog 4906, 36-pp, covers centrifugal pumps for wide, industrial use and especially adapted to handling ashes, abrasive mixtures, slurries, hot and corrosive liquids. It describes several basic types; a horizontal shaft, single-stage side suction pump; a horizontal shaft, single-stage, rear-entrance automatic priming pump; vertical shaft pumps with standard, overhead and quill bearings for wet pit applications. Nagle Pumps.

310 Compressor Data — Feather valve compressors from 75 to 350 hp are described in 32-pp Bulletin L-676-B1A. Advantages on installation, operation and maintenance costs are outlined for types YC and DYC compressors. Information and illustrations are offered on component parts, including frame, running gear parts, intercooler, crosshead, motor and main bearings and various cut-away views are included. Variable capacity control information is listed along with data on governors. Diagram illustrates correct selection and coordination of auxiliary equipment. Worthington Corp.

311 Compressors — Bulletin A72, 36 pp, gives construction, operation information on company's Class WN-114 heavy-duty air compressors. Illustrates seven models of compressor as a single unit for displacement capacities from 1186 to 1948 cfm, twin units furnishing up to 3896 cfm. Joy Mfg. Co.

312 Portable Compressors—Twelve-pp Catalog GG-9A pictures 40 models of company's portable type compressors. A quick reference chart shows capacities, engine types, and mountings available. Illustrates such features as: replaceable cylinder sleeves, interchangeable valve parts, aircraft type compressor cylinders, heavy duty industrial type engines, and magneto ignition on all gasoline models. Le Roi Div., Westinghouse Air Brake Co.

313 Gas-Engine Driven Compressors — A two-cycle turbocharged compressor is described in 24-pp Bulletin 134. Stresses economy of installation and operation afforded by this gas-engine driven unit, lists other advantages. Explains how turbocharging saves on fuel and cooling. Design and construction features are discussed. Clark Bros. Co.

314 For On-the-Spot Air—Eight-pp Form 2302 features company's self-contained Spot-Air portable compressor. Deals with the many tools it will operate, with actual on-the-job illustrations pointing out added advantages of this light-weight compressor on jobs where bigger compressors are not needed. Ingersoll-Rand Co.

WATER CONDITIONING

315 Feedwater Treatment — Process Bulletin B1, "Treatment of Boiler Feedwater by the Direct, or Internal Method," discusses advantages of direct treatment, as a complete treating program or as a supplement to external systems. Explains why direct treatment is convenient, economical and complete, and points out how it improves steam quality and reduces boiler maintenance costs and downtime. National Aluminate Corp.

316 For Industrial Water Softening—Greensand, zeolite and resinous exchange water softeners are described in 8-pp Form S105. Discusses features and applications of each of these basic types and illustrates some installations. Includes capacity data and general specifications. Also describes and pictures controls for water softeners, pressure filters and deionizers. Illinois Water Treatment Co.

317 Chemical Control and Testing — The need for intelligent chemical control and testing to assure the success of a water conditioning program is described in this 6-pp pocket-sized folder. Emphasizes need for explicit control limits and chemical tests to show that these limits are being met, and the proper technical skill required to prescribe these limits. Hall Laboratories, Inc.

318 Testing Equipment—Designed for use as a guide in the selection of water testing equipment, this 12-pp bulletin describes complete line of titration stands and tests for hardness, alkalinity, chloride, sulfide, etc.; cabinets and test set for similar tests; Conducto Bridge for determination of specific conductance of water solutions, colorimetric comparators; and the photometer. W. H. & L. D. Betz.

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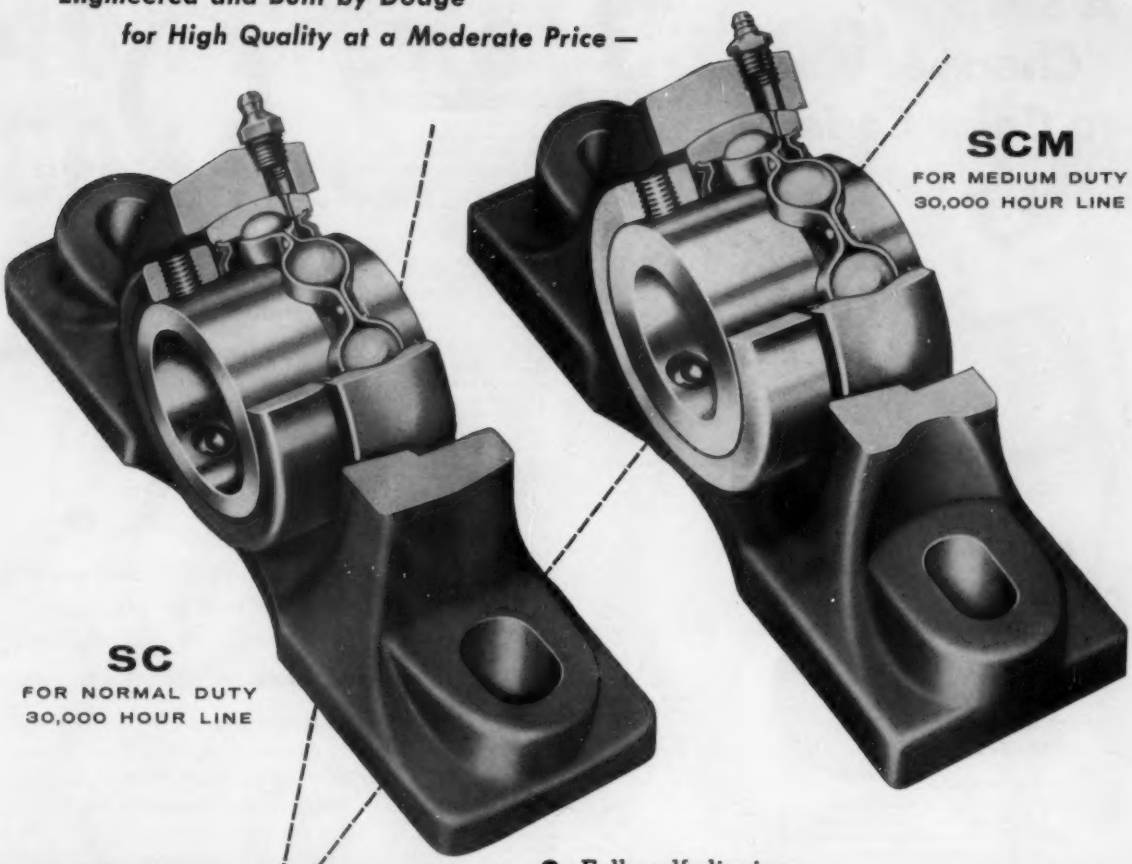

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DATA FILE

(Begins on page 230)

LUBRICANTS, LUBRICATION

319 **Automatic Lubrication**—Sixteen-pp Catalog L-52 describes force feed lubricators of all types of machinery. Illustrated, gives full design and construction details on company's open and enclosed type lubricators, available in capacities from 2 to 32 units, 1 to 24 feeds per minute. Hills-McCanna Co.

320 **Proper Lubrication**—Presenting proper lubrication as the life blood of all machinery, 36-pp Lubriplate Data Book 54-1 is a helpful treatise on modern lubrication practice. Gives product data on both oil type lubricants and greases and discusses choice of lubricants for use in applications involving heavy loads, high speeds, extreme temperatures, water conditions and other conditions. Provides tables of specific recommendations for various classes of equipment used in chemical processing, metal-working, other industries. Lubriplate Div., Fiske Brothers Refining Co.

321 **Centralized Lubrication** — Pocket-sized 24-pp, Form 34-22, called "Ask Anyone in Industry" describes in comic-book form the hazards and inefficiency inherent in conventional lubrication practice and promotes use of centralized lubrication—in the form of Alemite Accumeter measuring fittings. Shows how these are connected by tubing to a lubrication pump controlled by a timer. Alemite Div., Stewart-Warner Corp.

322 **For Better Lubrication**—Advantages of company's lubricants which are specially compounded for lubrication of reduction gear drives are outlined in this pocket-size folder. Features which assure smooth, trouble-free gear drive performance and lower maintenance costs are listed. Gulf Oil Corp.

323 **"Fringe Area" Lubrication** — Revised Bulletin 103A lists 17 types of molybdenum disulfide lubricants and features an explanation, with diagrams, of applications in extreme bearing pressure, and high, low and normal temperature lubrication. Five new lubricants are included. A selector chart describes each type, kind of carrier used in it, temperature range in which it operates best, and method of application. The Alpha Molykote Corp.

324 **Multi-Purpose Grease** — This bulletin describes Gargoyle Grease BRB No. 1, intended to provide correct lubrication for practically all normally loaded anti-friction and plain bearings. Tells how it resists leakage, affords protection. Socony Mobil Oil Co., Inc.

325 **Lubricating Air Conditioning Machinery**—The problems of lubrication of air conditioning machinery are discussed in V.41 No. 7 of "Lubrication," a company magazine. Describes various components of refrigerating system and discusses lubrication practice, effects of refrigerants on lubricating oil, oil carryover, and lubricating oil requirements. The Texas Co.

INSTRUMENTS, CONTROLS

326 **Versatile Electronics**—How flexibility of electronic temperature controls makes them useful in a wide range of heating and air conditioning installations is explained in this 16-pp booklet, Bulletin SA-2681. Purpose of publication is to fill the gap between the theory of electronic bridge circuits and specific control layouts and circuit diagrams. Four basic features that give electronic control its flexibility and application to a wide variety of installations are described. Minneapolis-Honeywell Regulator Co.

327 **For High Temperature Control**—Bulletin PT 556 contains descriptive data, specifications and dimensions on company's Type P2T photoelectric pyrometer designed to provide greater flexibility in measurement of automatic high temperature control. Explains how pyrometer indicates temperature changes on a meter and provides relay action to give a signal or to control heating devices. Photoswitch Div., Electronics Corp. of America.

328 **Orifice Meters**—Bulletin 1050 Rev. 1, 28 pp, shows how manufacturer's orifice meters

Q.

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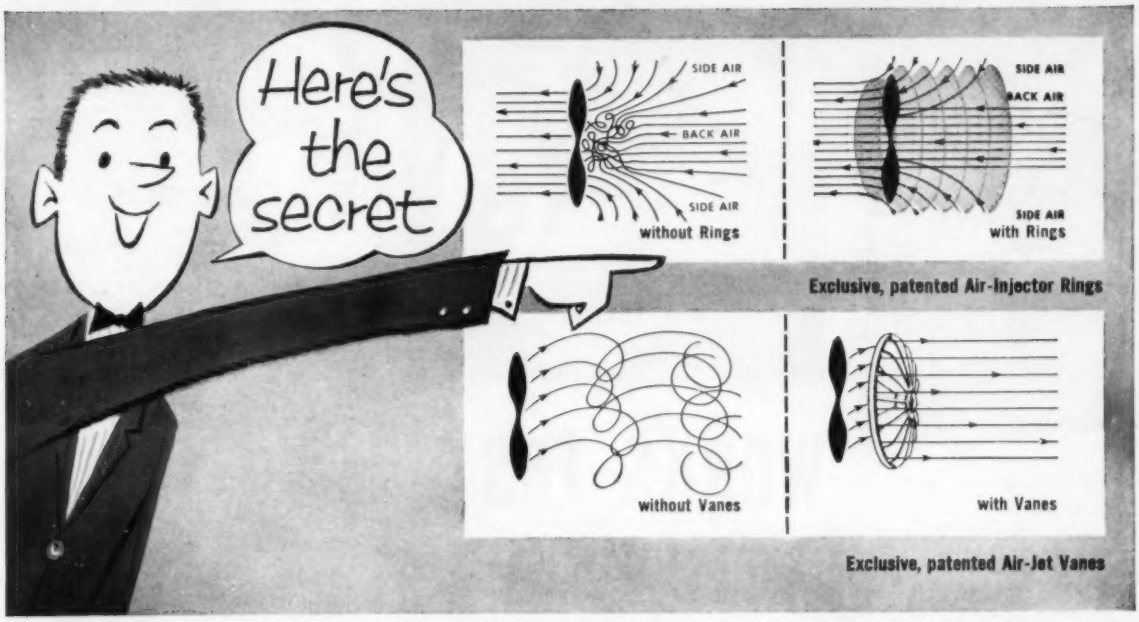

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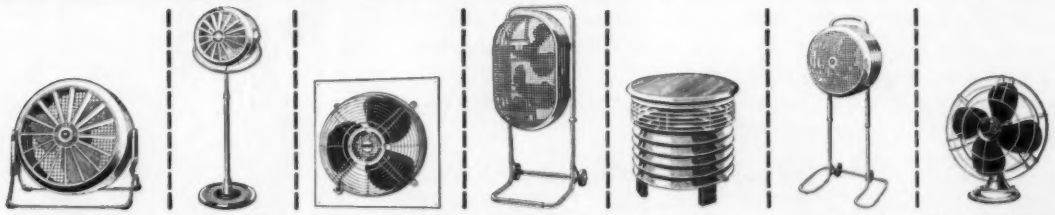

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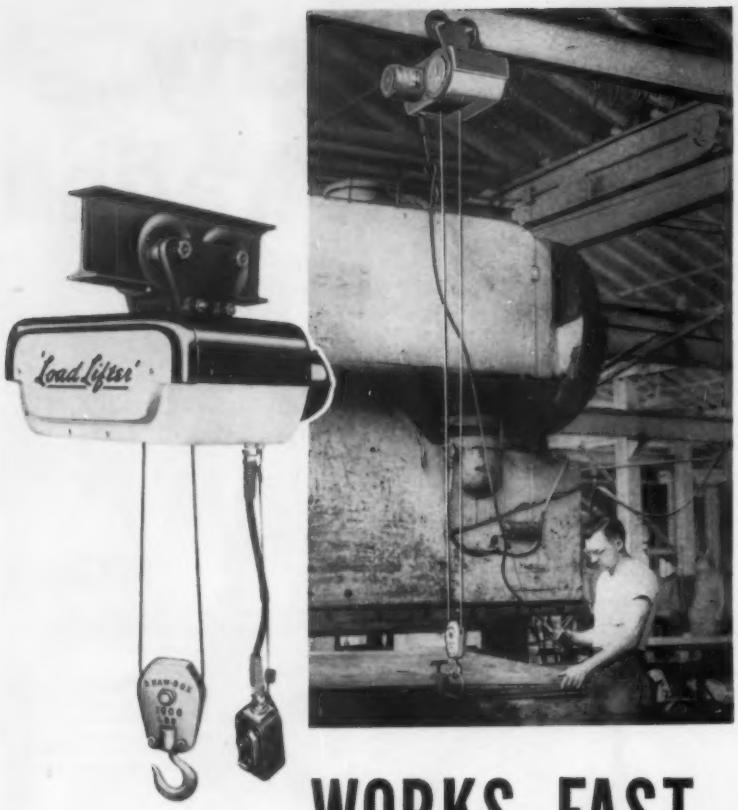

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For more facts circle 666 on Reply Card

DATA FILE

(Begins on page 230)

are made, how they operate. Tables give capacity data, and there are descriptions of manifold arrangements and differential ranges, along with illustration of various parts. Sketches show how meters are used. Rockwell Mfg. Co.

329 **For Industrial Metering**—Practical selection and application data on meters for industrial liquids are provided in 20-pp Form 566. Explains value of metering in batch mixing, process and cost control. Illustrated charts show how to select proper meter according to type, temperature and flow rate of liquid to be metered, and include specifications for models shown. Strainers, valves and other accessories are described. Neptune Meter Co.

330 **Thermostatic Shower Control** — Safety advantages of the Hydroguard thermostatic controls for showers are outlined in illustrated Bulletin 366. Design and construction details are shown, capacity, and applications in industrial plants and institutions cited. The Powers Regulator Co.

ELECTRICAL

331 **Polyphase Motors** — Bulletin 103 provides design features of company's Loadstar polyphase motors conforming to new NEMA standards and also gives tabulated information on the changeover. Open drip-proof and totally enclosed fan cooled motors are covered. Photos show construction details. Leland Electric Co.

332 **Motor Buying Guide** — Bulletin GEC-1026, 28-pp, features company's standard a-c fractional and integral horsepower motors in most general use. Included are general- and definite-purpose, fractional horsepower motors, and fhp gear motors. A section on selection of integral horsepower motors covers horsepower requirements, enclosures, starting current limitations, speeds, motor types, and selection of fuses and circuit breakers. Descriptions and specifications cover single-phase, polyphase, totally enclosed fan cooled, and gear-type integral horsepower motors. Photos, ratings, dimensions, weights, frame numbers, and modifications included. General Electric Co.

333 **Motors**—General specifications for company's open drip-proof motors and splash-proof motors, and enclosed motors are contained in 8-pp Bulletin 800. Includes data on construction features, electrical specifications, dimensions, mounting dimensions, as well as dimensional diagrams. Brook Motor Corp.

334 **Motors, Brakes, Transformers**—Bulletin G-55-2, 8-pp, outlines advantages of company's line of motors, brakes and transformers. Describes applications, construction features, and lists rating data. Wagner Electric Corp.

335 **Variable Speed Motors**—Sixteen-pp Bulletin 1797, revised, outlines many reasons why variable speed motors can be used to improve production, and it includes illustrations of all types of company's Varidrive motors, as well as their mechanical features, remote controls; etc. U. S. Electrical Motors, Inc.

336 **Enclosed Switches**—Catalog 83, 28-pp, describes in detail enclosed switches for industrial applications. Included are general switches designed for use on either a-c or d-c purpose switches, sealed switches, heavy-duty limit switches, hand operated switches, and maintained-contact switches, all of which are available in a variety of actuator designs, contact arrangements and electrical ratings. Photos, dimensional drawings, circuit diagrams, electrical data are included. Micro Switch, Div., Minneapolis-Honeywell Regulator Co.

337 **FHP Manual Starters**—Bulletin 224 is a folder giving the features and ratings of a line of fractional horsepower manual starters. Lists applications for them. Square D Co.

338 **Switch Wiring Diagrams**—Bulletin 709 is a 36-pp booklet of typical wiring diagrams for across-the-line starting switches. Indexed and arranged for easy use, this booklet serves as a guide to some of the many ways in which this company's manual and magnetic across-the-line starters can be applied. Some of the diagrams incorporate more than one

DATA FILE

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useful feature. Includes key to electrical symbols used. Allen-Bradley Co.

339 Small Motor Switches — This 14-pp booklet describes a line of toggle, rotary and pushbutton switches—popular types designed to meet requirements of manufacturing, plant maintenance. Generously illustrated, this booklet also includes complete rating tables. Cutler-Hammer, Inc.

340 Motor Controls—In the 86-pp Controlog are cataloged a variety of motor controls including starters, control centers, contactors, relays, switches, and accessories. Fully illustrated with photos and dimensional drawings, gives application and descriptive information on each class, and includes prices and ordering data. General engineering data for estimating purposes included. The Clark Controller Co.

341 Commutator Slip Ring Maintenance—This practical little 40-pp handbook gives procedures and methods for commutator and slip ring maintenance. Generously illustrated with photos and sketches, booklet contains sections devoted to common troubles and their corrections; brushes; general maintenance; and company's products for maintenance of commutators and slip rings. Defines commutator terminology. Ideal Industries, Inc.

342 What You Should Know About Circuit Breakers—Sixteen-pp Manual 101 explains operating principles of basic circuit breaker designs and provides engineering data on factors of application. Includes simplified diagrams of three basic types. Illustrates with colored charts and diagrams, explains temperature factors, inrush current effects, tripping and reset time. Heinemann Electric Co.

343 Electrical Conduit—This 8-pp bulletin, Form 646, describes company's heavy-duty, rigid steel electrical conduit, reproducing test data sheets to show how the protected conduit stands up under corrosive attacks of salt spray, sulfuric acid, caustic soda, and exposure to excessive heat. Four-color photos illustrate the effects on this and other conduit after exposure to attacks listed above. National Electric Products Corp.

344 Trolley Busway Systems—Three bulletins offer real help on electrical installations involving cranes and hoists, assembly and production lines, moving test lines and other moving electric equipment. Bulletin 35 (28-pp) covers 225-500 amp systems: Bulletin 40 (44-pp) 100 amp systems; Bulletin 45 (40-pp) 60 amp systems. Each includes special sections on installation planning and procedure, methods of mounting and descriptions and illustrations of equipment. Feedrail Corp.

345 Finding Fault Grounds—This 32-pp illustrated booklet covers use of the Allen ground detector in the detection and location of electrical fault grounds. Separate chapters cover grounded vs ungrounded systems, operating instructions, explanation of misreadings encountered, complete cancellation, detection of fault grounds in lead-covered underground cable, tracing buried and/or hidden elements. Excel Electric Service Co., Inc.

346 Wire and Cable—Bulletin 1096, 16-pp contains detailed information on electrical wire and cable, as well as insulation and protective covering. Two selection charts—one by application and environment and one by cable type—are a practical guide to selection of best cable for a particular application. Minimum standard industry specifications are listed. Trade names, products and applications are also given. The Okonite Co.

347 Aluminum Conduits — Bulletin 2681, 24-pp, lists copper-aluminum conduits designed to resist the corrosive action of many chemicals in highly corrosive locations. A pictorial index and price list cover the various types available. Crouse-Hinds Co.

348 Power and Control Cables — Sixty-pp Catalog 24 describes typical power and control cable designs and is intended as a guide in selecting proper wire and cable type. Describes insulations, sheaths and coverings, electrostatic shielding, and includes product data on all types listed. Rome Cable Corp.

349 Cable for Lighting—Sixteen-pp Publication 19-294, of interest to plant engineers concerned with road lighting, offers help in selecting the type of cable best suited to a particular installation. Both series and multiple street lighting are discussed. Specification data is given on cables for direct burial, and for use in conduit, duct or open-air as well as for cables for overhead lines. Splicing and terminating methods for insulations given. Construction Materials Div., General Electric Co.

350 Battery Manual—Battery selection techniques are emphasized in 20-pp Bulletin 210, a revised edition of this manufacturer's manual on storage batteries for stand-by power, emergency lighting and switchgear applications. A discussion of charging equipment and simplified battery maintenance procedures is included. Storage battery installation procedures are described and illustrated by photos. Exide Industrial Div., The Electric Storage Battery Co.

The two Reader Service Cards on pages 225-226 are easy to use and need no postage. Just circle the item number of catalogs wanted.

351 Handbook on Storage Batteries—This 64-pp booklet of instructions and technical data is the sixth edition of this company's battery service manual. Provides a brief treatise on the theory of the lead-acid battery. Gives detailed instruction on the care and operation of batteries, on maintenance and repairs, and on standard and special parts. Booklet is of special value to plant engineers concerned with storage batteries for cycle service in industrial trucks and materials handling equipment. Gould-National Batteries, Inc.

352 Motive Power Batteries — This 48-pp general service manual on lead acid batteries for all types of motive power application is a practical guide to industrial cycle service, including industrial truck, air conditioning, and others. Includes photos, charts, tables, methods of repair, maintenance and theory of operation, instructions covering repairs with regular or special tools, simplified testing methods including safety practices, acid handling precautions, and charging methods. C & D Batteries, Inc.

353 Testing Instruments — Bulletin 19-56, 16-pp, features company's electrical testing instruments, including ohmmeters, ground testers, dielectric test sets, motor rotation tester, cable fault locating equipment, transformer turn ratio test sets, corona test equipment, frequency meters, tachometers, others. Includes photos and descriptions of each type, including chief features, operating ranges, and suggested applications for them. James G. Biddle Co.

354 Wire-Wound Components—Catalog R-200, a 36-pp guide to manufacturer's electronic components, describes subminiature resistors, precision and power resistors, IF and RF transformers and coils. Table and charts give specifications. I-T-E Circuit Breaker Co.

355 Flexible Cords — This well-illustrated 24-pp booklet includes all new Underwriters' classifications for flexible cords manufactured by this company. Featuring data on Dynaprene and rubber jacketed cords as well as braid covered types, also gives tips on how to select proper cord. Whitney Blake Co.

LIGHTING, COMMUNICATIONS

356 Fluorescent Lighting—This 24-pp fluorescent lighting guide book is a reference digest on fluorescent products. Gives advantages of this type of lighting; summarizes various lamps and parts, including starter sockets, lampholders. Includes reference chart for lamp performance when interchanged with typical ballasts. Sylvania Electric Products Inc.

357 Lighting Unit Standards—A complete compilation of new RLM Specifications is presented in the 48-pp 1955 edition of this authoritative booklet. Covers 46 different types and

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Now, NEW Pat'd. "Sexauer" SELF-LOCK screws, with expanding NYLON PLUG imbedded in the threads, fasten and *lock* at correct depths AUTOMATICALLY, hold faucet washer *firmly*. Made of rust and corrosion resisting Monel, heads won't twist off, screw slots won't distort; they can be used over and over.

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The hidden costs of faucet leaks!

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DATA FILE

(Begins on page 230)

sizes of incandescent and fluorescent industrial lighting units. In addition, booklet explains reasons for the standards, discusses the basis for the specifications and the objectives of the manufacturers participating in the RLM Inspection and Certification Service. RLM Standards Institute, Inc.

358 Plant Lighting Planning Guide—This 32-pp handbook of industrial lighting presents economics of a plant lighting program in terms of lower production costs, reduced working time, less fatigue and eyestrain, less spoilage, fewer accidents, better morale. Explains six major steps in initiating, developing and carrying out a lighting program; tells how to select equipment and stresses importance of maintenance. Includes table of recommended levels of illumination for industrial interiors. Benjamin Electric Mfg. Co.

359 Signal Equipment—Tips on how to select suitable signals for any specific operation are offered in one of a series of bulletins—Nos. 100-125—bound in this 40-pp catalog. Other bulletins describe horns, bells, warning lights, other signal equipment. Specifications, photos, wiring diagrams, dimensions, audibility rating charts, electrical characteristics and other data included. Federal Sign & Signal Corp.

360 Sound Measurement—Form 797-C, 12-pp, outlines the many applications of sound and vibration measuring instruments and describes several models of sound level meters designed for measuring intensity of sound and analyzing its various frequency components. Includes specifications and full descriptions of the models, along with photos of the instruments in use and data on various accessories. General Radio Co.

FANS, BLOWERS

361 Standard Duty Fans—Design and construction details of company's line of standard duty fans are covered in 28-pp Bulletin 543. Points out advantages, shows arrangement and application, describes accessories. Tables list material specifications. The New York Blower Co.

362 Vaneaxial Blowers—Direct-drive, vaneaxial blowers, three types of belt-drive blowers and a portable blower for exhausting fumes from tanks are described in 16-pp Bulletin A-110. Includes dimension drawings, also air delivery tables. Hartzell Propeller Fan Co.

363 Ventilating Equipment—Design and engineering data on company's line of ventilating fans and blowers are presented in 32-pp Bulletin 310. Includes table showing air change requirements of various types of rooms and areas, discusses details of fan operation and design, the use of ducts, special conditions which govern fan selection, design and operation of blowers. A section on how to design systems is included. Ilg Electric Ventilating Co.

MECHANICAL POWER TRANSMISSION

364 Sprockets and Chain — Bulletin A-624 24 pp, is compiled to provide plant engineers with all data required for selecting and ordering roller chain and sprockets. Devotes a page to Taper-Lock sprockets for each size of chain from 40 to 100, giving sectional drawing, dimensions, number of teeth, maximum stock bore available, weights, prices and other data. Another page covers Taper Lock bushings; and full information is given on riveted and cotter-type roller chains. Dodge Mfg. Corp.

365 Roller Chains, Sprockets—Catalog 754, 64 pp, describes, illustrates a line of roller chain stock sprockets, including minimum bore sprockets for reboring, also finished bore and Taper-lock bushed sprockets which are ready to use. Tables show speed ratios for sprocket combinations, standard keyways and setscrews. Includes chain selection and application data, installation and lubrication recommendations, chain length calculations, dimensions and price lists for single and multiple strand roller chains. Diamond Chain Co.

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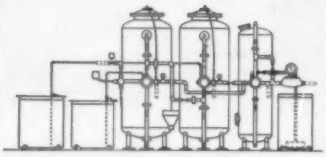

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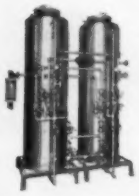

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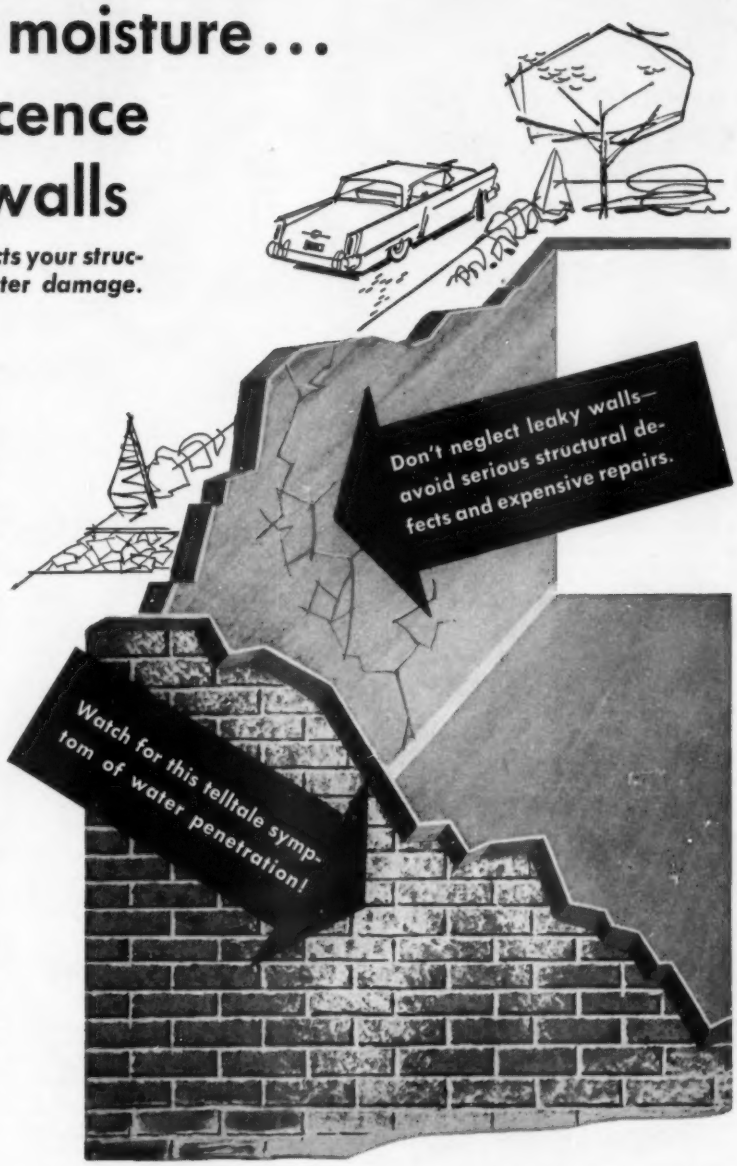
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DATA FILE

(Begins on page 230)

366 Power Transmission Equipment—Form 118, 24 pp, gives descriptive and technical information on variable speed pulleys, wide V-belts, sheaves, motor bases, countershafts, and Select-O-Speed transmissions. Illustrated with photos and dimensional drawings, booklet provides ratings, sizes, application and installation tips. Lovejoy Flexible Coupling Co.

367 Improved V-Belts—This literature on company's Vulco rope drives explains how this rope with concave sides is designed to fill out to a precise fit in the sheave groove, to provide less wear, more pulley contact and more sure power when needed. The Gates Rubber Co.

368 Flexible Couplings — Condensed Engineering Catalog 51-A contains excellent data on the choice and use of company's flexible metal couplings. Tells advantages of these couplings and discusses design principles. Double-flexing and floating shaft types, light duty couplings and types for special applications are described and pictured in detail. Thomas Flexible Coupling Co.

369 Fluid Couplings—Bulletin 144-D, 14-pp, presents complete installation and performance data on fluid couplings. Illustrated with diagrams and drawings, bulletin shows ease of applying company's fluid couplings on any type industrial equipment, powered by any type electric motor or internal combustion engine from ¾ to 850 hp. Describes standard models providing standard input, output combinations, and standard models in packaged units. Installation hook-ups are given, along with typical applications. Twin Disc Clutch Co.

370 Adjustable V-Belt — This 8-pp catalog covers company's Veelos TD and TE V-belt designed to reduce installation and operation costs on big drives. Studs, cup-washers and T-screws of the belt are illustrated, and installation and operation characteristics explained. Booklet includes directions on how to measure, to couple and uncouple, and to install. A table shows current lengths for these belts. Manheim Mfg. & Belting Co.

371 Shaft Mounted Drives—Plant engineers who use machines requiring input speeds between 420 and 10 rpm in the range between ½ and 30 hp, will be interested in 8-pp Bulletin 7101. Contains complete information — design data, selection tables, dimensions, weights, installation photos—on this modern type of standard gear drive designed for high ratios of speed reduction in limited space, with savings in initial and installation costs. The Falk Corp.

VALVES, TRAPS, PIPING AND ACCESSORIES

372 Choosing the Right Valve—Presenting valve selection as a matter of matching the valve's service characteristics with the service requirements of the job, this practical 20-pp booklet explains and illustrates basic design features of gate, globe and check valves. It tells in non-technical language, how each of these valve types works, and where it is best suited for use. Disc, stem connection, bonnet and bonnet-joint characteristics are also discussed and stem-operation is treated. Crane Co.

373 Corrosion Resistant Valves—Monel and nickel corrosion-resistant valves are described in Bulletin 9. Discusses corrosion-resistant properties of Monel and nickel, listing specific applications for which each is suited. Gives casting composition of both alloys and describes their mechanical properties. Cross-sectional illustrations of gate, globe and check-type valves are included. Alloy Steel Products Co.

374 Bronze Valves—Globe and angle bronze valves with rising stems, union bonnets and stainless steel plug type seats and discs are described in this bulletin. Discusses design advantages, gives dimensions. The Walworth Co.

375 Valve Charts—Now available to plant engineers are three well-organized wall charts on valve types, selection and protection. "How to know valves" covers four main types of valves from the standpoints of their appearance, inside construction, service intended, operation and use. "How to select valves" dis-

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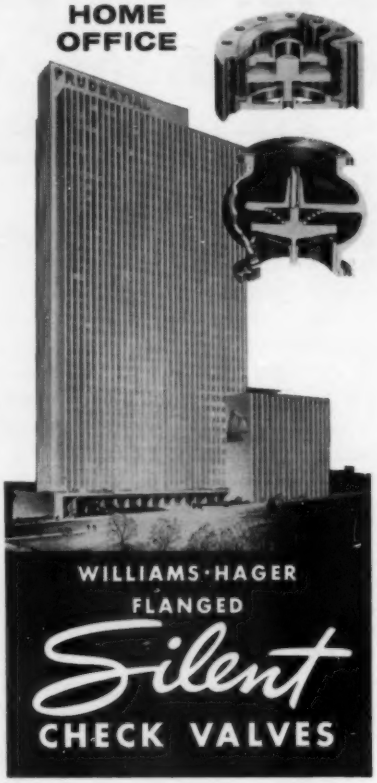

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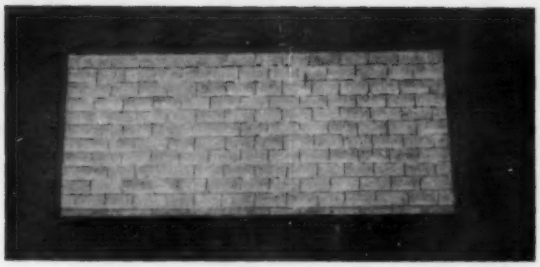

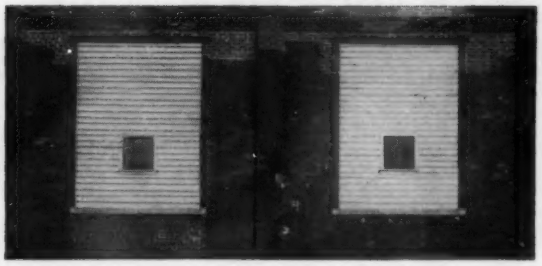

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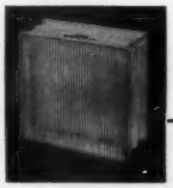

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DATA FILE

(Begins on page 230)

cusses five major factors involved in the choice of a valve—fluid, temperature, pressure, size, and function. "How to protect valves"—written in "do and don't" style, covers 11 important points on valve installations, operation and maintenance. R-P & C Valve Div., American Chain & Cable Co.

376 Butterfly Valves—Construction details, engineering and application data on butterfly valves are provided in three illustrated bulletins. Eight-pp Bulletin 557 covers those of standard heavy-duty construction; Bulletin 558, 8 pp, those of standard medium-duty construction; and Bulletin 559, rubber-lined butterfly valves. W. S. Rockwell Co.

377 Reducing Valve Engineering Data—Bulletin 962 explains how the contour of a pressure reducing valve contributes to efficiency of performance. Discusses straightline flow, tight closing. A. W. Cash Co.

378 Unions, Check Valves—Illustrated Catalog 55, 24-pp, describes and provides ordering information on a line of forged steel unions and check valves. Socket-weld, high-speed, orifice, O-ring and other unions are included. Catalog provides service recommendations, dimensions and list prices. Also included is table covering discharge of water to atmosphere. Clayton Mark & Co.

379 For Quick Valve Selection—Here's a 20-pp catalog digest providing ordering and application information on gate, globe, angle and check valves in bronze, iron, cast and forged steel construction, also valve accessories and parts. Illustrated, includes pressure-temperature chart. The Ohio Injector Co.

380 Plug Type Valves—Bronze plug type valves with 500 Brinell armor seat are illustrated and described in this 6-pp brochure, Form 202. Includes photos of various models, full specifications, as well as a cutaway view showing outstanding features. Jenkins Bros.

381 Lubricated Plug Valves—Catalog PV-4, 36-pp, shows in detail a line of iron and steel lubricated plug valves. Many illustrations of single, screwed and bolted gland type valves are shown, including photos, sectional and detailed drawings. Also included is physical data on dimensions, ratings. The Wm. Powell Co.

382 Steam, Air and Gasoline Traps—Catalog 751, 32 pp, is a trap ordering book with capacity tables, installation diagrams, and containing charts and formulas for determining proper size trap for specific applications. Covers thermostatic steam traps, expansion steam traps, weight-operated traps for steam, air, gasoline, pressure up to 1500 lb. W. H. Nicholson & Co.

383 Steam Trap Selector—Twelve-pp Bulletin T-9 is designed specifically to aid in the selection and application of steam traps on chemical processing equipment. Features a fold-out piping diagram for 22 pieces of typical processing equipment—each showing recommended steam trap and piping arrangements. Also contains steam trap selector tables. Yarnall-Waring Co.

384 Steam Trap Solutions—Bulletin F-151, titled "Solving Steam Trap Problems," is a 36-pp illustrated booklet giving specifications and capacities of steam and float traps, air release valves, pipe line strainers. Tells how to calculate condensation loads and select traps for unit heaters, jacketed kettles, submerged surfaces. Gives pointers on installing and servicing traps. Also included in this edition is information on combination flat and thermostatic traps. The V. D. Anderson Co.

385 Valve Couplings—Bulletin 551 presents engineering data on company's line of valve couplings, hose couplings and hose clamps. Includes dimensions for valve couplings, price list, and a table showing dimensions of standard hose couplings. C. B. Hunt & Son, Inc.

386 Wrought Iron Pipe—Technical information required in specifying pipe and tubing is graphically presented in this 52-pp catalog. Tables list size and dimensional data of wrought iron pipe and tubular products, and show dimensions. Data is also provided on wire and sheet metal gages, flow of water in gpm and conversion factors. Tables include size and dimensional data for various types of pipe. Supplementary tables give information on wrought iron physical characteristics and special properties. A. M. Byers Co.

387 Welded Fittings—Catalog 3 is a 36-pp ordering and engineering reference book on company's Weldolets for piping services. Gives data on butt-welding and socket welding Weldolets as well as on Thredolets for making threaded outlets. Typical installations are pictured; sizes, weights and prices provided. Also included are installation instructions and a technical section. Bonney Forge & Tool Works.

388 Pipe Insulation—Bulletin F 1-100 features on-the-job installation photographs of cellular glass insulation for pipe temperatures between —300 and 800 F. Complete listing of physical properties, condensed specifications are given. Pittsburgh Corning Corp.

389 Piping Insulation — Seven-pp Bulletin SO 1054 features a snap on, one-piece molded pipe insulation of fine glass fibers for hot or cold piping. Specifications are given for industrial, commercial, and institutional piping where maximum efficiency is of primary importance and for hot water and low pressure steam. Gustin-Bacon Mfg. Co.

390 PVC Pipe, Fittings—Illustrated Bulletin PE-40, 12 pp, gives physical properties, uses and specified dimensions of manufacturer's polyvinyl chloride pipe and fittings. Provides data on chemical resistance, plumbing and installation of this rigid, opaque thermoplastic piping for use in handling high-corrosive, moderate temperature liquids. Corning Glass Works.

CONSTRUCTION

391 Aluminum in Architecture—This 32-pp booklet provides information on use of aluminum, and of special interest is a discussion on architectural colors for aluminum exterior surfaces. Also describes basic types of aluminum finishes—satin, sandblast, bright, and "as fabricated." There are drawings and details of copings and gravel stops; curtain wall products, including facings, panel assemblies and wall units; industrial roofing and siding, weatherside and underside fasteners; trim and molding; sheet, plate, foil, pipe, rod and bar stocks; and structural shapes. An alloy section lists mechanical properties of applicable alloys. Aluminum Co. of America.

392 Panel Wall Construction—The advantages of company's M-Type Q-Panel walls are outlined in 12-pp Bulletin Q-35-55. Includes installation photos, diagrams, specifications, as well as drawings pointing out structural details. H. H. Robertson Co.

393 Data on Panel Material—This 12-pp booklet is a new edition of a guide to the use of Presdwood. Generously illustrated with drawings and photos, it describes basic and special Presdwood products and their properties, tabulates available sizes, describes working and finishing methods, and illustrates various finishes. Masonite Corp.

Postage-free Reader Service Cards make it easy to order catalogs. Cards are provided on pages 225 and 226.

394 Glass Block Fenestration—The natural ventilation characteristics of glass block fenestration are presented in this illustrated report of a test project. In some 88 pages, report covers sun hoods, window types, dual outlets, air speeds, double loaded variations, reverse draft, and ventilation below the window sill. Test data is summarized and recommendations included. Kimble Glass Co.

395 How to Glaze with Plexiglas—Sixteen-pp Booklet PL-23 gives detailed information on glazing industrial and other buildings with flat panels of the acrylic plastic Plexiglas. Written for plant engineers concerned with frequent breakage of windows or other glazing problems. Gives properties and behavior of this sheet. Plastic Dept., Rohm & Haas Co.

DATA FILE

(Begins on page 230)

396 **Fiberglass Reinforced Panels**—This file of bulletins covers fiberglass-reinforced panels for a wider range of industrial glazing jobs. Data is provided on shatterproof panes, Fire-Snuf panels, and metal-reinforced security panels. Strength test reports and physical data as well as information on light transmission qualities are included. Resolite Corp.

397 **Glass for Industrial Use**—How glass is used and how to choose the proper type for the application are covered in 12-pp Catalog 56-1. Discusses glass according to function; light diffusion and glare reduction; decoration; protection; and heat absorption. Photos showing various finishes and typical installations are provided, along with performance data, selection and installation tips, light transmission ratings and other data. General advantages offered by company's line of glass are also detailed. Mississippi Glass Co.

398 **Fiberglas Panels**—Folder IC-95 describes company's flat panes and corrugated translucent fiber glass panels for varied industrial use. Contains information on first scientifically engineered fiberglas flat panes for glazing, with suggested construction details for metal-covered buildings and double-pitched skylights. Illustrations show typical industrial installations. Alsynite Co. of America.

399 **Steel Floor Plate**—Skid resistance and other advantages of multigrip rolled steel floor plate are stressed in this illustrated bulletin. Also gives dimensions, weights, data on allowable loads. Typical uses of the floor plate are pictured. United States Steel Corp.

400 **Non-Slip Flooring**—Algrip, an abrasive rolled steel floor plate described as non-slip even on steep inclines, is the subject of Booklet AL-29, 8 pp. Discusses safety features; gives fabricating data. Alan Wood Steel Co.

402 **Metal Grating Handbook**—Sixteen-pp Form 500 is data and specification manual covering all types of grating, open steel floor armor, stair treads, vessel liners, decking and drain grates. Contains safe load tables for basic types of gratings, panel width constant charts, tables on standard widths and types of steel treads, types of anchors used for grating. Klemp Metal Grating Corp.

403 **For Stairway Construction**—This 12-pp illustrated booklet describes the use of this company's Junior channels in stairway construction. Provides specifications and shows some of the buildings in which the channels have been used as stair stringers. Tables give size and weights, and show allowable loads. Jones & Laughlin Steel Corp.

404 **Brick Floors**—Advantages of brick as a floor material are pointed out in this illustrated bulletin, 3h/Dr. Stresses such qualities as handsome appearance, excellent sanitary properties, resistance to acids and alkalies, durability, easy cleaning. Application photos included. Drehmann Paving and Flooring Co.

405 **Air Tools, Paving Breakers**—These two bulletins describe company's latest models of paving breakers and air tools for plant construction and maintenance work. Bulletin PB1 gives features and specifications on heavy-duty, medium-weight and lightweight paving breakers, as well as tools for use with them. Bulletin ST-100 describes and gives specifications for clay spaders, trench diggers and backfill tampers. Gardner-Denver Co.

STORAGE EQUIPMENT

406 **Adjustable Shelving**—How this shelving can save assembly time is explained in 28-pp Form 2111. Photos and drawings of various types of shelving units, including open and closed shelving, bin units, ledge shelving, counter shelving, cabinets with swinging and sliding doors, parts and accessories, are included, along with specifications. Standard Pressed Steel Co.

407 **Storage Equipment**—Catalog 100-E, 72-pp, illustrates and describes company's com-

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Contains helpful information on design uses, and prices of Chromalox Electric heaters, elements, thermostats, contactors and switches.

To get some interesting facts about additional applications of electric heat, ask for Booklet F1550—"101 Ways to Apply Electric Heat."

Edwin L. Wiegand Company

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- ☐ A copy of "101 Ways"
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A-4455A

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DATA FILE

(Begins on page 230)

plete line of steel cabinets, folding chairs, chests and safes, stools, tool boxes, work benches, tool stands, shelving, tool storage, lockers, coat racks, filing cabinets, revolving bins, others. Includes dimensions and other specifications. Photos illustrate some typical equipment installations. Lyon Metal Products, Inc.

MAINTENANCE

409 Building Maintenance — Handbook 7 offers 64 pp of information on floor surfacing, leak stoppers, external wall sealants, roadpatching, roofing materials. Includes instruction for applying them. Flexrock Co.

410 Better Floor Care — This illustrated folder describes products designed to aid efficient floor care. Lists combination scrubber-vac machines, conventional scrubbing-polishing machines, steel-wool pads, applicators, vacuum cleaners, mop trucks and other mopping equipment. Included are waxes, sealers and cleaners. Finnell Systems, Inc.

411 Cleaning Problem Solutions—Illustrated Bulletin 154, 12 pp, presents information on a wide range of cleaning methods and shows equipment available. Special emphasis is placed on the stationary vacuum cleaning system and its long-run economy in many installations. The Spencer Turbine Co.

412 For Fast Floor Repairing — This illustrated bulletin covers Kwik-Roc, a fast and tough hardening material for repairing holes and cracks in concrete floors. Tells how to prepare surfaces for Kwik-Roc, how to mix, place, and store it. Includes service recommendations. A. C. Horn Co., Inc.

413 Basic-Roofing Information—"What You Should Know About Your Roof" is a 40-pp clearly illustrated booklet which tells what makes a roof fail, how to recognize signs of roof deterioration, what to do to keep a roof in good condition. Discusses recommended roofing practices, essentials of a good re-roofing job, also special features of company's roofing materials. Johns-Manville.

414 Insulation Coating—This 32-pp illustrated handbook, Form L-17, presents the advantages of company's NoDrip insulation coating for preventing condensation drip from metal, concrete, brick, wood, plaster or composition surfaces. Lists applications and describes methods of applying. Contains tabulated data on quantity required to cover various size tanks and pipe. J. W. Mortell Co.

415 Protective Paints — Details on a rubber-base paint formulated to afford increased protection against corrosion from acids and alkalis and especially applicable for use on concrete, are provided in this literature. These finishes are also suggested for wood and metal. Cellulose Products Dept., Hercules Powder Co.

416 Industrial Vacuum Cleaner—Advantages of using company's floor-type vacuum for industrial cleaning jobs are stressed in this illustrated bulletin. Describes operation, points out typical applications and includes dimensions and specifications. Handling Devices Co., Inc.

417 Off-the-Ground Maintenance — Bulletin G205R, 8 pp, discusses the subject of controlling costs when maintenance goes above arm's reach. Describes trestles, swinging scaffolds, aluminum scaffolds, ladder scaffolds, step ladders, extension ladders, storage racks and other equipment designed to handle every type of overhead maintenance problem. Pictures applications. The Patent Scaffolding Co., Inc.

WIRE ROPE, SLINGS

418 Sling Handbook—The 64-pp Tuffy Sling Handbook is replete with illustrations, charts and diagrams describing 16 factory fitted slings and nearly two dozen standard fittings available for slings, including several which are recent additions to the line. Book contains a complete rigger's manual, shop chart of ratings, an engineer's notebook and standard signals for directing operations of overhead traveling cranes

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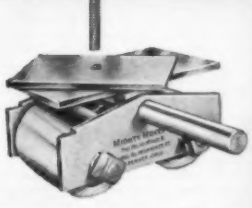

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Crashes here are good for business. But tough on motors. There's the obvious problem of shock—constant start and stop, arcing from the overhead pick-up, overloading in jam-ups.

Yet Leland engineers have designed and built a motor so ideally suited to the job that two of the nation's largest producers of this type of playland equipment use Leland motors exclusively. And have for years.

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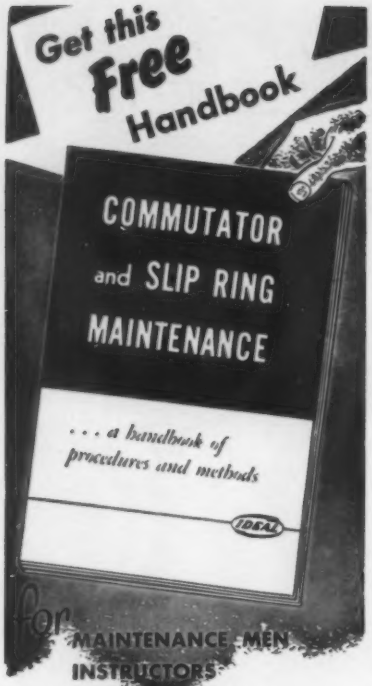

THE methods and procedures described were developed by recognized, practicing maintenance authorities. They have been proven by conclusive evidence over many years in hundreds of operations. A concise guide, this 39-page handbook tells the practical operating man everything he needs to know about:

- **Commutator and slip ring troubles and how to correct them.**
- **Brush maintenance and operating procedure.**
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DATA FILE

(Begins on page 230)

and derricks and locomotives. A new development featured is the steel ferrule splice now on all Tuffy slings, which affords safety and other advantages. Union Wire Rope Corp.

419 **Sling Chain Handbook**—Illustrated Data Book 100, 32-pp, presents "how to do it" information on sling chains—from ordering to care, use and inspection. Contains diagrams, charts and tables on standard and special styles of sling chains and attachments, and their sizes, weights, and working load limits under many conditions. Columbus McKinnon Chain Corp.

420 **Wire Rope Assemblies** — Catalog 5201, 22-pp, describes company's wire rope assemblies, used for operating controls, as a part of machinery and equipment, or for slings and hoists. Gives general applications for various types of wire rope assemblies, and includes specifications, ordering details. Macwhyte Co.

BOILERS, GENERATORS

421 **Packaged Boilers** — This 16-pp illustrated catalog describes manufacturer's new Type VP Package boiler. Following a section of background information is an outline of principal design features of these boilers, which are shop assembled and provide steam capacities from 4000 to 40,000 lb per hour. Space requirements are shown in a table along with specifications. Combustion Engineering, Inc.

422 **Steel Boilers**—Revised General Catalog 80, 32-pp, is a condensed but complete product guide on company's high and low pressure steel boilers. Also included are full descriptions and illustrations of water heating products, both direct fired and storage types as well as indirect water heating coils. Pages on boiler support brackets, structural steel suspension and induced draft fans, as well as pictures of installations are included. Kewanee-Ross Corp.

423 **Automatic Boilers**—Advantages of company's packaged automatic boilers for light oil, heavy oil, gas or combination gas-oil firing are outlined in Bulletin 1220. Describes two models, and includes ratings, dimensions and weights, as well as installation photos. Orr & Sembower, Inc.

424 **Automatic Boilers**—Bulletin BE-4 describes operation and advantages of Continental automatic boiler's spinning gas technique—a method of obtaining maximum heat transfer with a simplified design. Shows cutaway view of boiler construction; illustrates hinged doors and method of injecting air through static, turbine-like vanes into burner. Boiler Engineering & Supply Co., Inc.

425 **Packaged Generators**—This 16-pp catalog covers a new series of packaged steam generators in sizes from 10,000 to 46,000 lb of steam per hour. Gives capacities, dimensions, construction features. Instrumentation is discussed. Illustrations include sectional drawings and installation photos. Booklet also provides a selection chart on firing equipment and controls. Foster Wheeler Corp.

SPACE, PROCESS HEATING

426 **Unit Heaters**—Bulletin 7517, 48 pp, presents full information on latest design of this company's Venturafin unit heaters for steam or hot water applications. Gives features of construction, general engineering data, capacity tables. Fully illustrated with photos of horizontal and vertical models, dimensional drawings and piping diagrams, booklet includes tips on the use and selection of unit heaters. American Blower Corp.

427 **Plumbing, Heating Supplies**—Edition H is the current edition of this company's 126-pp general catalog on plumbing and heating repair parts, tools and accessories. Indexed and generously illustrated; gives sizes, intended uses. J. A. Sexauer Mfg. Co., Inc.

428 **Unit Heaters** — Catalog 155, 32 pp, presents unit heaters for steam and hot water in vertical and horizontal delivery and power-throw types. Covers design features and provides performance and capacity data. Also

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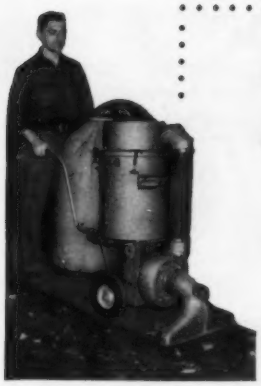

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Floormobile is a powerful, highly mobile floor cleaning machine that *sucks up dust*, as well as dirt, lint, string, cloth, paper, and other trash. Brooms or mechanical sweepers can't eliminate dust . . . they just stir it up, causing unnecessary cleaning work and damage . . . the cost of which is staggering. Floormobile gives you *dust-free* floor cleaning. Over 250 nationally known companies now have one or more Floormobiles in daily use.

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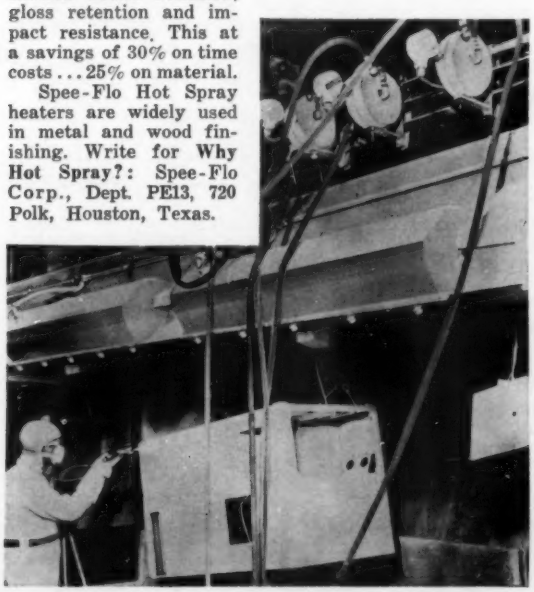

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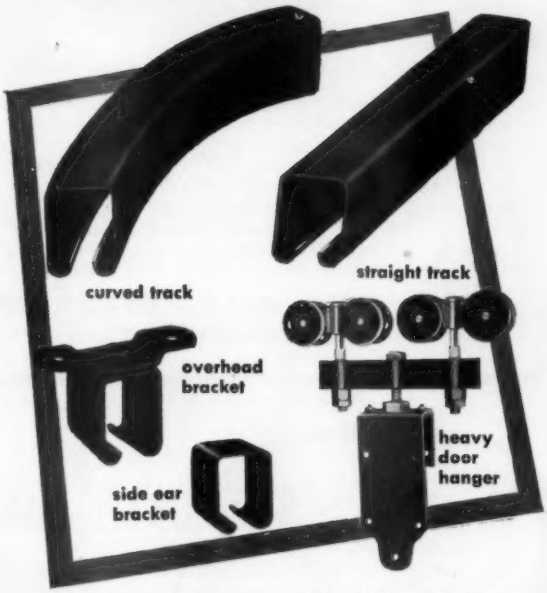

For both new and remodelled buildings, Coburn Sliding Door Hardware is ideal for every type of sliding door—straight sliding, sliding-folding, around-the-corner, roundhouse and fire doors.

This line includes door hangers, brackets and tracks for doors weighing up to 1500 pounds, measuring up to 3″ in thickness. Straight track in standard lengths of 6′, 8′, and 10′, and curved track of the desired turn radius makes Coburn Sliding Door Hardware the practical answer for every hanging door installation.

For additional information write to Coburn Sales and Engineering, 56 Sterling Street, Clinton, Mass.

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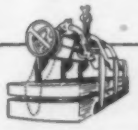

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DATA FILE

(Begins on page 230)

provides information on unit heater selection, sound ratings, locating unit heaters, motor wiring and control. Piping and installation suggestions are included as well as typical unit heater specifications. Modine Mfg. Co.

429 **Revolving Unit Heaters**— Bulletin HR-6A, 16 pp, features revolving unit heaters for industrial plant heating, presenting design and construction details and showing typical installations. Engineering data, mounting heights and coverage, and dimensions are tabulated, and dimension drawings are included, along with installation planning tips and specifications. L. J. Wing Mfg. Co.

430 **Electric Heat, 101 Ways**—Principal industrial heating applications and methods are described in "101 Ways to Apply Electric Heat," a 32-pp booklet. Illustrated case histories show how metal-sheathed electric heating units are being used. Physical aspects of installation are detailed along with a discussion of the problem, solution and advantages obtained. To illustrate liquid heating, diagrams and photos show best applications for the elements and heaters. Similar treatment is accorded problems of heating air and gases; melting soft metals and viscous materials; and heating machinery and equipment parts. A section is devoted to far-infrared heating. Edwin L. Wiegand Co.

431 **Hot Water Heating Systems**—Catalog GK-954, 24 pp, features a complete line of equipment for forced hot water heating systems and chilled water cooling systems. Nine pages are devoted to information on a complete line of circulating pumps for dozens of applications. All-bronze pumps for circulating service water and silent operating centrifugal pumps for boosting water pressure are a few of the new applications. Valves, fittings, air vents, air tanks and water heaters are also described in detail. Bell & Gossett Co.

432 **Hot Water for Industry**—An excellent engineering data booklet, "Hot Water for Industrial Plants," is a compilation of literature covering use of water heaters for process needs, cafeterias, lavatories, wash fountains, laboratories. Discusses hot water requirements for these applications; describes and illustrates heaters, recovery systems, booster units applicable; provides installation suggestions and operating instructions. Available to qualified plant engineers, please state your title. A. O. Smith Corp.

433 **Industrial Ovens**—Engineering, manufacturing and installation of processing ovens are described in Bulletin D-53-20, 16 pp. Covers oven types, application to industry source of heat, selection of heater, control of heat, distribution of heat. Photos show typical oven installations, and a complete modern finishing process is presented. Newcomb-Detroit Co.

434 **Industrial Ovens** — Thirteen types of company's Conventioneered ovens, which apply principles of forced convection heating to various industrial processes, are illustrated and described in 12-pp Bulletin 200. These ovens serve foundries, metal finishers, plastics producers. The W. W. Sly Mfg. Co.

TOOLS, WELDING, AND MACHINE SHOP EQUIPMENT

435 **Portable Electric Tools — This 1955** Standard Catalog, Form 10, 24 pp, features company's line of portable electric tools, including electric drills, bench-drill stands, hole saws, buffing and polishing kits, sanders, polishers, grinders, hammers, saw blades, vacuum cleaners, and others. Photos and full specifications included. The Black & Decker Mfg. Co.

436 **Pipe Tool Ordering Guide**— Catalog 2-51, 8 pp, covers company's line of threaders, cutters, vises, dies, tongs and wrenches; gives prices. Armstrong Bros. Tool Co.

437 **Data for the Shop**—"Fluids and Facts for Metal Working" is a pocket-size booklet of about 44 pp. A section on metal working fluids covers their function and selection, preparation and use of soluble oils and paste compounds, and prevention of dermatitis. A section

Vacuum FROM A TO Z for Industry

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The wide range of Vacuum equipment and tools is described in Bulletin No. 155 and more than 100 unusual uses are described in Bulletin No. 144.

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Such radiographs are indispensable in manufacturing pressure vessels that will meet every test of time and use. Each x-ray is checked by a representative of the Hartford Steam Boiler Inspection and Insurance Company — for further insurance that every P-K heat exchanger meets or exceeds the rigid standards of the 1952 ASME Code for Unfired Pressure Vessels.

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Heat Exchangers • Converters • Storage Water Heaters • Condensers
Water Chillers • Oil Heaters • and all types of heat transfer equipment

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DATA FILE

(Begins on page 230)

on metal working facts gives conversion tables, steel numbering systems, machinability ratings of metals, drill grinding charts, twist drill sizes and other data. Standard Oil Co. (Ind.)

438 **On Spot Welding**—"Spot Welding from One Side—With a Portable Gun," 12-pp, describes an inert-gas-shielded tungsten-arc spot welding process. Over 30 tables, weld cross-section and application photos, drawings and graphs are included. Sections of text cover when to consider spot welding from one side, how the equipment operates, standards and test procedures, factors affecting weld. Air Reduction Sales Co., Div., Air Reduction Co., Inc.

MATERIALS HANDLING

439 **Cranes for Big Jobs**—A new 1½-yard shovel, 35-ton crane is described in this 6-pp catalog. Action pictures of the machine in quarries and gravel plants are included, also specifications. American Hoist & Derrick Co.

440 **Electric Hoists**—Twelve-pp Bulletin DH 133B describes Speedway electric hoists of 500- to 4000-lb. capacities. Fully illustrates and explains design features and gives details on suspensions and conductor systems. Clearance data, specifications included. Wright Hoist Div., American Chain & Cable Co., Inc.

441 **Electric Hoist Manual**—Catalog 215-B offers 38 pp of engineering, application and ordering information on company's Load-Lifter electric hoists. Presents hoists with hand operated trolleys and with power travel, hoists with lug suspension, hook suspension and push-type trolleys, and with hand-geared trolleys. Manning, Maxwell & Moore, Inc.

442 **Electric Chain Hoist**—Twelve-pp illustrated Bulletin 158 describes company's Lodestar, a compact, heavy duty electric chain hoist. Bulletin presents a complete description, including specifications and prices of the hoist which is available in capacities from ½ to 1 ton for operation on 115 v and 208-220/440 v power. Chisholm-Moore Hoist Div., Columbus McKinnon Chain Corp.

443 **Manual on Electric Hoists** — Catalog H-46, 40 pp, covers monorail and stationary hoists and car pulleys. Explains fundamental types of grabs, methods of hanging I-beams, types of hoist suspension, controls. American Engineering Co.

444 **Transit Crane**—Twelve-pp Bulletin 15-B-TC-1 describes a transit crane of 15-ton capacity. Illustrated by job application photos and closeups of mechanical features, the booklet includes a list of specifications and working ranges, plus brief, easy-to-read description of the machines, advantages. Bucyrus-Erie Co.

445 **Continuous Power Conveyor** — Sixteen-pp Catalog A-96 describes a packaged overhead conveyor for light duty applications. This complete basic "package" contains drive unit, take-up, oiler and other items essential for a 50-ft system. Describes power drive unit, track, power chain and other components and discusses lubrication and chain safeguards. Suggested layouts are diagrammed, and some installations of these conveyors are illustrated. Richards-Wilcox Mfg. Co.

446 **Engineered Conveyor Systems**—Catalog 853, 32 pp, illustrates conveyor systems in use in a wide range of industries, showing how they suit handling requirements involved. Roller, wheel, belt, chain, overhead trolley and elevating conveyors are included, also spirals, portable power conveyors, ball transfers and special equipment. Mathews Conveyer Co.

447 **Conveyor and Elevator Belting Tips**—This 32-pp manual on installations, maintenance and care of conveyor and elevator belting, uses photos and drawings to show ways to improve belt service and lengthen belt life. Includes a discussion of belt design, covers, reinforcements and grades. Repair methods, splicing, and fastenings are also covered, and there's a table listing common conveyor belt maintenance problems. The B. F. Goodrich Co.

448 **Conveyor Belting** — Folder 54-3, contains a capsule description of construction, types of treated stitched canvas belting for all conveying and elevating applications. Describes company's general conveyor and elevator belt, oil- and acid-resisting belts to handle hot materials to 600 F. Imperial Belting Co.

449 **Metal Conveyor Belts** — This 24-pp booklet is an illustrated guide to selection of metal conveyor belts. Presents both conventional and balanced spiral weave belts; covers raised edge and flight constructions, chain edge construction, high temperature belts, wire conveyor aprons. Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp.

450 **Engineered Conveyors** — Bulletin 156, 8 pp, discusses design and performance of company's material handling and production systems, engineered to solve specific problems in the handling and production of various materials. Covers overhead conveyors, ultra time and synchronized conveyors, trans-free conveyors, TV tube settling conveyors, pig stacker, others. Allied Steel and Conveyors Div., The Sparks-Withington Co.

451 **Lift Truck Work Kit**—A method of predetermining the time necessary for fork lift trucks to perform specific operations is provided in this work kit, designed to enable plant engineers to apply fork lift truck standard performance data. It can assist in determining efficiency of fork lift trucks now in use as well as in planning for future needs. Includes typical materials handling examples to show technique for application of the data, as well as charts providing times for basic truck motion elements. The Yale & Towne Mfg. Co.

452 **Oil-Hydraulic Lifts — Catalog RE-203**, 20-pp, covers the field of heavy-duty oil-hydraulic lifting devices for industrial applications. Featured in catalog are company's standard Levelator lifts, a 6000 lb single-jack model and a 12,000 lb dual-jack lift. Also featured is an electric pump mounted on an oil tank for powering oil-hydraulic devices. Illustrates lift platforms, platform accessories and safety devices, jacks, power units. Rotary Lift Co.

453 **Sheet Lifter**—Operational and design features of company's sheet lifting equipment, which contributes toward efficient handling, flexibility and economy are explained in Bulletin S-25, 16 pp. Cullen-Friestedt Co.

454 **For Heavy Moving**—How Mighty Movers solve heavy moving problems with economy, safety and speed is detailed in this illustrated folder. Lists various applications and includes specifications. Mighty Mover Co.

455 **Adjustable Ramps**—Engineering details and other information on use and installation of company's hydraulic adjustable ramps for loading docks are featured in this illustrated bulletin. Two types of dock equipment are treated—the Adjust-A-Dock, installed in the loading platform or at its level, and the Adjust-A-Truck, installed at ground level to raise or lower rear wheels of truck. Rowe Methods, Inc.

The Two Reader Service Cards on pages 225-226 are easy to use and need no postage. Just circle the item number of catalogs wanted.

456 **Shock Absorbing Casters** — Twenty-pp Catalog FH-53 describes construction features of company's Floating-Hub casters, listing types and mountings now available. Load ratings for each type and size are provided. Stresses, by text and illustration, how these shock absorbing casters work, permit smooth travel over rough floors. The Bassick Co.

457 **For Hopper Economy**—"In Dollars and Sense" explains long run economy of company's self-dumping hoppers showing how they operate and telling how they fit particular plant requirements. Illustrated with photos, gives dimensions, weight of a standard 1-yd model. Roura Iron Works.

458 **Railroad Car Spotter**—Book 2092 describes a car spotter with which one man can easily spot six loaded railroad cars at one time — or handle scores of other tasks involving horizontal haulage in either direction or around corners. This spotter consists of a vertical capstan, helical and worm gear drive, housing and integral motor. Engineering information, instructions for calculating rope pulls and typical layouts for both car spotters and car pullers are provided. Link-Belt Co.

PLASTICS, SYNTHETICS

459 **Super Polyethylene** — A new type of polyethylene which has greater heat resistance, greater structural stiffness, and better appearance than previous types, is the subject of 16-pp Bulletin C-5-216. Properties of the thermoplastic material are detailed, as well as typical applications. Chemical Div., Koppers Co., Inc.

460 **Rigid Plastic Fabrications** — Eight-pp Bulletin 9-2 describes rigid plastic fabrications and pipe. Outlines use of Type I polyvinyl chloride in fabrication of exhaust systems and process equipment. Resistance characteristics and physical properties of the plastic are provided. Also includes section on plastic pipe and fittings. Tables on chemical and physical properties of Type I and II polyvinyl chloride and styrene copolymer rubber resin blend rigid plastic pipe are provided. The Atlas Mineral Products Co.

461 **Nylon For Maintenance**—Nylon as a maintenance material for mechanical, chemical and electrical applications is described in this illustrated folder. Advantages are given, and specific uses listed along with a lineup of material's maintenance properties. Stock shapes and sizes are shown and finished parts illustrated. Tips on machining are offered. The Polymer Corp. of Pennsylvania.

462 **Neoprene Design Book**—This illustrated bulletin discusses the properties of Neoprene, showing how they are utilized in products made from this chemical rubber. Covers its toughness, hardness range, air retention, performance under load, at extreme temperatures, flame and chemical resistance. Elastomers Div., E. I. du Pont de Nemours & Co.

DUST CONTROL AND AIR CONDITIONING

463 **Dust Control, Blast Cleaning**—Bulletin 1210, 24 pp, fully illustrated, describes manufacturer's line of blast cleaning and dust control equipment, accessories. It is indexed according to equipment, type and purpose. Lists three methods of application. Pangborn Corp.

464 **Dust Control**—"Engineered Efficiency in Dust Collection and Recovery," 36 pp, discusses industrial dust recovery from standpoint of nuisance abatement, waste avoidance, hazard elimination. Shows effect of variation in particle size, distribution and specific gravity of dust on efficiency of the dust collecting system. Buell Engineering Co., Inc.

465 **On Dust Collection**—Specifications and descriptive details about company's Hydro-Filter are contained in 12-pp Bulletin 55. Tells how unit uses filtering principle to trap dust by impingement on glass spheres; entrapment on bubble surfaces and containment within water droplets. Separating efficiencies, application data, construction and design, as well as a description of models, capacity range available and description of laboratory facilities are included. National Dust Collector Corp.

467 **Manual of Exhaust Hood Design**—Bulletin 270-E1, 24 pp, features engineering data on dust control systems for the metal working industries. Illustrates and discusses the design of exhaust hoods for many operations in this field. Also, 61 photos of dust control installations show various methods of hooding dust source. American Air Filter Co., Inc.

468 **Flexible Hose**—A set of five bulletins (Nos. 40 through 44) are of interest to plant engineers concerned with the design, installation or purchase of flexible hose for dust and fume control, air conditioning and materials handling. They provide general information, data on installation, application suggestions, technical data and prices on hose, duct and accessories. The Flexaust Co.

469 **Dust Filter**—Design, application and benefits of company's AC dust filter are de-

Another Marsh development... new "SAFE-CASE" gauge for these conditions where over-pressures of explosive force can occur.

Face well protected by solid metal wall; but, still more important, *entire back* is thin metal plate that opens out to exhaust any abnormal pressure. In testing, heavy blank cartridges, fired within back of case, did not even break crystal.

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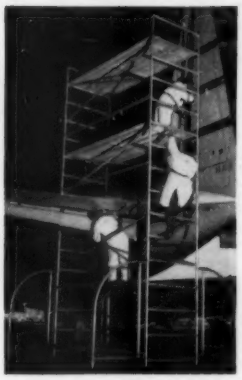
ALUMINUM SCAFFOLDS...

by The Patent Scaffolding Co.

New 4'6"-Wide Ladder Scaffold



Large platform working areas are featured in this new 4'6"-wide ladder scaffold. It is especially designed for overhead repairs, painting, cleaning, relamping and other overhead work where great mobility and stability is desirable. Outriggers may be added to give additional stability when platform height exceeds 18". Both scaffold and separate outriggers have swiveled, rubber-tired casters for easy movement to all parts of a plant. Lightweight aluminum components make the scaffold easy to erect and move. Base section is 6'7" high with casters. Other heights possible by combining additional ladder units 5'4" and 4' high and by using 24" leg adjustment. Diagonal braces give 6', 8' or 10' spans. Write The Patent Scaffolding Co., Inc., 38-21 12th St., Dept. PE, Long Island City 1, N. Y.

2'-Wide Ladder Scaffold

Has same features as 4'6"-wide scaffold, but is 2' wide. Ideal for maintenance work in narrow hallways and aisles. Rolls right through standard 30" doorway. Can be used with diagonal braces to give spans of 6', 8' or 10' platform. Compact—parts lie flat and take up little room. Write The Patent Scaffolding Co., Inc., 38-21 12th St., Dept. PE, Long Island City 1, N. Y.

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One man can erect the base section of the "Fold-A-Way"* Scaffold in less than a minute. End frames swing open sideways, while the base section is in a standing position, making an easily managed swing of about 90°. Adding additional 6' sections takes just a few minutes. Basic unit is 4'6" x 6' and is 7' high including rubber-tired casters. Ball bearing extension legs permit height adjustment up to 24". Approved by Underwriters' Laboratories, Inc. For more information on the "Fold-A-Way"* Scaffold write The Patent Scaffolding Co., Inc., 38-21 12th St., Dept. PE, Long Island City 1, N. Y.

* Trade Mark

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DATA FILE

(Begins on page 230)

scribed in illustrated 26-pp Bulletin 559. Filter performance curves, principle of air filtration, filter comparison charts, woven vs felted filtering media are featured, along with technical data on design, capacity ratings, dimensions, velocity, air volume and pipe friction tables. Installation photos and drawings of typical equipment layouts are included. The Day Co.

471 **Air Conditioning Filters**—Bulletin 600, 8 pp, describes company's Staynew ventilation and air conditioning filters. Specifications, engineering, performance and installation data covering dry type panel filters for the removal of air-borne impurities given. Dollinger Corp.

472 **Air Conditioners**—Full information, including unit specifications, on company's redesigned line of water-cooled packaged air conditioners is given in 8-pp Form L-241. Explains and illustrates features contributing to operating economy and longer life. Discusses installation. Airtemp Div., Chrysler Corp.

SANITATION

473 **Insect Control** — Featuring manufacturer's insecticides and insect control equipment, this practical 36-pp booklet provides excellent tips on the control of industrial insects. More than 60 pests are pictured along with specific information on where they are found, identifying features, extent of damage, life stages and cycles, characteristics of existence, and recommended control measures. Ten insecticides are discussed in detail. Atomizers, mistorizers and fogging units are pictured and described as to advantages and applications. West Disinfecting Co.

474 **Advice on Washrooms**—Information on company's washroom advisory service is available to plant engineers. Tells of plans and specific suggestions. Scott Paper Co.

OTHER EQUIPMENT

475 **Graphitization in Piping**—"Considerations in the Evaluation of Graphitization in Piping Systems," (Reprint TR-594) is a 10-pp illustrated article. Subjects discussed include sampling procedure; bend testing, impact toughness evaluation, and metallographic evaluation; uniformity of graphitization; and heat treatment. Grinnell Co., Inc.

477 **Teflon Products**—Three bulletins present this company's Teflon packings, gaskets, special parts and stock. Bulletin CP552 describes Chempro lines of Teflon ring packing, Teflon impregnated asbestos packing, V-type packing, and Teflon seal cage—for use with acids and strong chemicals. Bulletin CP553 covers Teflon jacket gaskets, solid ring gaskets, expansion joints and special gaskets. Bulletin CP554 illustrates special parts. Chemical & Power Products, Inc.

478 **Filters, Strainers** — Industrial Catalog 1054, 48 pp, provides application and engineering information on company's line of microfilters and precision strainers. Fuel filters, full flow and by-pass lube filters, air separators, and metal edge strainers for fuel lube and industrial use are presented along with construction details, performance data, and specifications. Purolator Products, Inc.

479 **Ductile Iron**—Cast iron that can be bent is described in this 28-pp revised edition, with tables, charts and photos. Photos show applications of ductile iron castings, and bulletin lists typical applications in various industrial fields. The International Nickel Co., Inc.

481 **Filter Fabric Facts**—This 16-pp illustrated booklet contains information about filtration principles; filtering devices; filter media; textile fabrics for filtration; a comprehensive chart on chemical and heat resistance of cotton and synthetic fabrics; sections on yarns, fabrics construction and finishing; and a round-up of filter fabrics in use. Photos illustrate variety of filter fabrics being produced for industrial use. Wellington Sears Co.

482 **Humidification for Profit**—Bulletin 500, 16 pp, includes physical data and prices on electrically controlled and air operated humidifiers. Handbook section explains how relative humidity affects hygroscopic materials, static electricity, health and comfort. Photos show installations and several pages are devoted to selection and installation tips. Many helpful tables included. Armstrong Machine Works.

483 **Finishing Systems**—Illustrated Catalog A-653, 12 pp, describes complete finishing systems for porcelain and synthetic enamel, lacquer, paint, and other finishing. Also covers a variety of other industrial equipment including ovens, dust collectors. The R. C. Mahon Co.

484 **Swivel Joints**—Catalog G-4, 32 pp, covers this manufacturer's line of ball-bearing swivel joints as well as other products including loading racks, manifolding lines, all-metal hose. In addition to providing dimensional and operating data on these products, this booklet is generously illustrated. Chiksan Co.

486 **Economy of LP Gas**—"The Aircraft Story," 8 pp, gives the report of a test made at one aircraft company, and results which another aircraft company obtained after converting their fleet of internal plant trucks to LP gas operation. Explains advantages of LP gas as an engine fuel and steps necessary in conversion of equipment to LP gas operation. American Liquid Gas Corp.

487 **Selector Charts** — Bulletin CE-50, 20 pp, contains selector charts on corrosion-resistant equipment for process industries. Tables cover general considerations in selection of material, physical properties, corrosion resistance, techniques and skill in manufacture of equipment. Describes rubber and plastic pipe, tubing and fittings; valves; pumps; rubber-lined tanks. American Hard Rubber Co.

488 **Glass Fiber Products**—Form WPD-11, 8 pp, describes and illustrates uses of Microlite and Super-Fine blanket insulations for thermal and acoustical treatments. Also features Microflex compressed board; a resilient cushion material; quartz and glass Micro-Fibers, reinforcements for plastics and yarns for use in textile industries. L. O. F. Glass Fibers Co.

490 **Fighting Corrosion With Corrosion** — Cathodic protection against rust and corrosion is the subject discussed in this illustrated 10-pp bulletin. Describes the corrosion battery, corrective measures, cathodic protection battery, and includes design and application data. Electro Rust-Proofing Corp.

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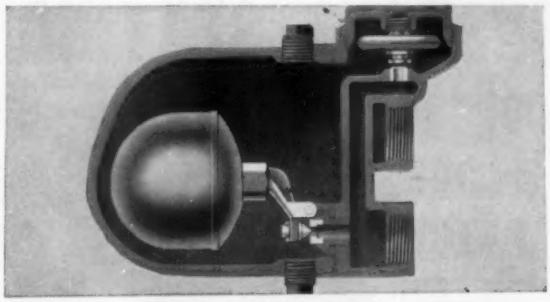

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NEW PRODUCTS

(Begins on page 160)

65—PENETRATING OIL comes in aerosol dispenser

Nu-Aero Penetrating Oil is designed for speed in loosening frozen fittings, nuts, bolts, sheaves; and the pressurized container makes it possible to carry penetrating oil in tool boxes. The aerosol

high pressure stream also affords easy application in difficult positions, or on distant points—the stream will shoot 4 ft in any direction. No long waiting periods are required for absorption with Nu-Aero Penetrating Oil, it is pointed out; action is almost immediate. The addition of Moly (molybdenum disulfide) to the other active penetrates is said to produce a product which both loosens and lubricates even under extreme conditions, and will not squeeze out of threads or evaporate from hot surfaces. Nu-Aero Penetrating Oil is claimed to cut rust, paint, grease, dirt, corrosion, and to be suited to hot applications, such as furnaces, steam or hot water fittings and flange bolts. Single cans sell for around $1.50 per can. Pressure Products Co.

66—HOPPER-COUNTER for small parts feeding

Not only an automatic orientation machine, the Feed-A-Matic is engineered to give a complete feed cycle, delivering the required unit to the point of use at high rates of speed. The unit can also provide mechanical or electronic counting and release of a predetermined quantity of units. Delivery speeds up to 200,000 units per hour are reported, depending on size and shape of part being fed. The Feed-A-Matic operates on a rotary type hopper principle. A major engineering feature is its versatility when changing from one size or shape of unit to another. The changeover can be made in about 5 min, says manufacturer, and no additional parts are required.

The unit consists of a cast iron or aluminum barrel with cast in pockets. Parts being fed are captured in these pockets as the barrel revolves and are trapped by stationary plates as they are carried to the top of the hopper. At this point, the plate ends, letting parts flow down a chute where they are oriented and fed to final point of delivery. Parts not properly oriented are rejected back into the hopper by a revolving wheel. Locking and jamming are impossible, company states, and action is gentle enough for pills and candies. U. S. Engineering Co.

More information on any of these products can be yours without cost or obligation. Just circle the item numbers on the Reader Service Cards provided on pages 225-226.

67—TAPE CUTTER speeds up packing operations

Handy to use and offering safety advantages, too, the 4G Cutter is made of heavy molded plastic with a steel cutting edge. It is designed for use with either ½- or ¾-in. tapes, is readily adapted for either size, and is claimed suited for cutting the heaviest strapping tapes now in use. It costs around 50 cents. Permacel Tape Corp.

68—EMULSION CLEANER routs oily soil, grease

Ke-Sonic, an emulsion cleaner for the removal of oily soil and greases is used for routine cleaning of heavy machinery and other equipment. Its uses include marine equipment, it is noted, because removed soil is held in stabilized emulsion

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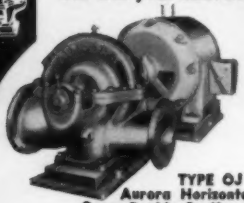

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NoDrip Plastic Coating acts immediately to insulate and protect. One application adds many years of service life to metal equipment. NoDrip is also resistant to acid, alkali and brine...protects concrete, brick, plaster, tile wood or composition surfaces.

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NEW PRODUCTS

(Begins on page 160)

even when mixed with sea water. One form, Ke-Sonic-C is employed by diluting with kerosene, diesel fuel or No. 2 fuel oil, and the soiled parts then sprayed, brushed, wiped or immersed in the solution. Ke-Sonic-C is corrosion safe on all structural metals, says manufacturer, and is unique among emulsion cleaners in that it will clean metal to provide a no-water break rinse.

Ke-Sonic may be diluted with up to 20 parts of water and used in industrial pressure washing machines for the removal of oily soil from metal parts. Both Ke-Sonic and Ke-Sonic-C are claimed fire safe—exhibit a Cleveland open cup flash point of 180 F and a Cleveland open cup fire point of 220 F. Kelite Corp.

69—CRUSHER offers increased efficiency, non-clogging

Using a pair of rotors with triangular crushing sectors rotating in opposite directions, the Double Rotor Knittel Crusher is designed to combine effectiveness of a double roll crusher with slugging teeth with the inherent advantages of the hammermill type crusher. Opposing rotation of the twin rotors tends to draw coal through the crusher, with heavy sectors breaking up lumps by impact. This is declared similar in results to action of slugging teeth on most double roll crushers. Following impact breakage, coal falls to the grate bars where the heavy sectors force it through, reducing it to desired size.

An advantage claimed for this crusher is ability to handle wet and sticky coal without clogging—there are no breaker plates upon which sticky material can build up, it is pointed out. The crusher is reported to show excellent horsepower per ton performance. Also of significance is its ability to automatically dispose of tramp iron, company notes; since tramp iron cannot be driven through the grate bars, the hanging sectors drive it against a battery of fingers which lift out of the way, allowing material to drop in a box. Stephens-Adamson Mfg. Co.

70—SCREW DRIVERS are built to stand abuse

Screw drivers in this company's 2000 line incorporate a green cushion-core feature

in their plastic handles. The cushion-core driver will withstand considerable abuse, says manufacturer, and was designed with the knowledge that a screw driver is used for a good many purposes other than turning screws. As the diagram indicates, the "plug" stops blows at the end of the blade where the force of the impact is otherwise directly transmitted to the plastic handle. The line comes in a full range of styles and sizes—regular, square and cabinet bars. Stanley Tools.

71—ELECTRONIC CONTROL for machine tool drives

This electronic control is designed particularly for variable speed machine tool drives. The control can be preset for specific spindle speeds, or supervised by mechanical or electrical means to provide continuously variable spindle speeds, in applications where constant lineal speed is needed at tool tips or grinding face. Manufacturer points out that these performance features make it well-suited for grinders, lathes, drill presses, ball mills and other machines with up to 5-hp drive motors. It provides a flexible means of automating machine processes common to many industries.

The control unit provides two full-wave thyraton rectifiers; one to supply and control power for the drive motor field, and the other for similar armature service. Available field voltage and armature current is throttled by voltages taken from the motor field and armature. These voltages are fed to the thyratron grids of the separate rectifier units. When motor

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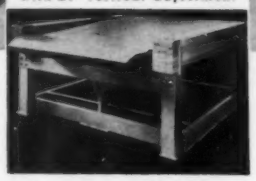

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NEW PRODUCTS

(Begins on page 160)

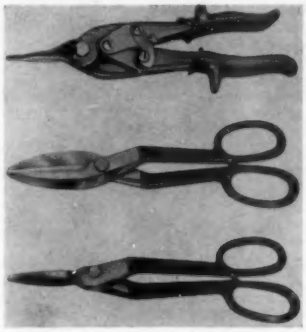
drive is slow, increased field voltage is supplied through the thyratron's increased conductivity, to adjust speed to preset value. At the same time, other thyratrons permit increased current in the armature. The simultaneous result is maintained speed at high torque, according to preset or automatic circuit settings. The electronic motor controls are supplied as complete metal clad switchgear for connection to 220/440 v a-c lines. Federal Pacific Electric Co.

72—FAULT FINDER for monitoring control circuits

This fault finder is designed to monitor control circuits continuously and indicate faults instantly in any one of six monitored circuits. It requires no warm-up time, is electrically isolated from monitored circuits, company says, and utilizes printed circuits and standard electronic components for minimum maintenance. As long as each monitored circuit is trouble-free, its signal lamp remains lighted. But if a fault occurs, even momentarily, the lamp is extinguished and remains so until the fault finder is manually reset. This reset feature serves to detect presence of momentary faults and make the unit a fail-safe device. Key component is a cold-cathode gas-filled tube which blocks current flow until its starting anode is energized; current flow ceases when current to its main anode is interrupted. Circuitry of fault finder is such that current flows to indicator lamp as long as main anode circuit is not interrupted. Westinghouse Electric Corp.

73—SNIPS, SHEARS for sheet metal work

Nine new sheet metalworker's snips and shears have been added to this manufacturer's line, including three new compound leverage shears (for straight, right and left cuts), three straight snips and three combination snips. The compound lever-



age shears multiply hand pressure to provide increased cutting power with minimum effort—18-gage steel can be cut with ease, it is claimed. Featuring 52 serrations to the inch, drop forged steel jaws are curved to divert the sheared metal.

Plastic hand grips have stop posts to prevent hand slippage and provide finger clearance. The three models can be quickly identified on a work bench by their different hand grip colors.

Straight snips (in three sizes) are made of drop forged steel and heat treated. The combination snips (in three sizes) are especially designed for intricate pattern and scroll work. Made of drop forged steel, the inner faces of the "duck bill" jaws are sloped for cutting curves and irregular shapes. This is an extremely handy tool when an assortment of snips is not available. Detailed specifications are contained in Bulletin 78. Niagara Machine & Tool Works.

74—LIMIT SWITCHES feature watertight plastic covers

Purpose of the Loxswitch plastic cover switches is to let the operator observe contact action in the interior without removing the cover. According to company, these switches have successfully completed severe kerosene and underwater tests and have received automotive approval. Plastic covers are made with a sturdy acrylic plastic material held in position by a steel frame and captive cover screws. A Neoprene gasket provides a water seal between housing and cover. Specification Sheet L102 PF gives more details—seven models and 19 contact arrangements are available. R. B. Denison Mfg. Co.

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It's the most versatile of all 6012 electrodes. Good wetting action of the Airco 387 electrode permits the use of high current and travel speed on both thick and thin sections. The fluxing action of the slag results in smooth, uniform deposits of superior appearance with minimum spatter. Especially recommended for single pass horizontal fillet welds because of ease of handling, good weld profile and ability to withstand high welding current.

This is but one of many electrodes in Airco's complete line that also includes stainless steel, hard-facing, cast iron, general and special purpose electrodes. Send for free Airco Electrode Guide which will help you select the right electrode for your specific job. Request catalog 1318-PE.

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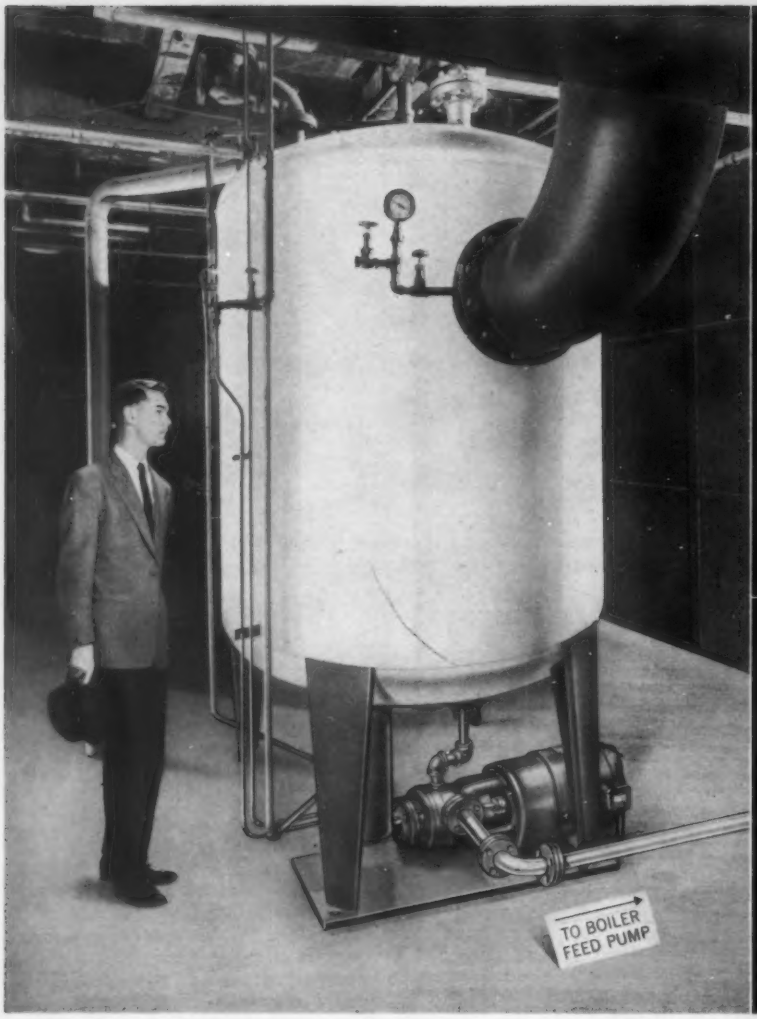

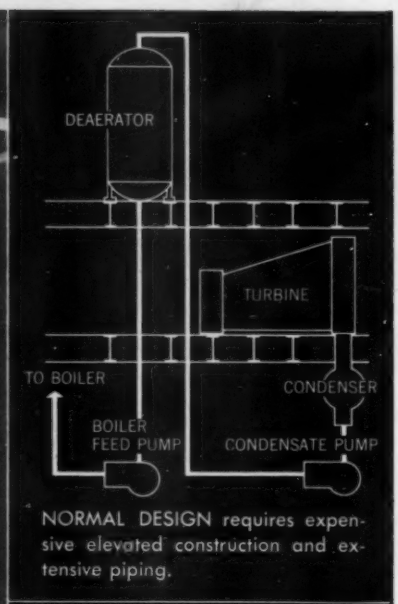

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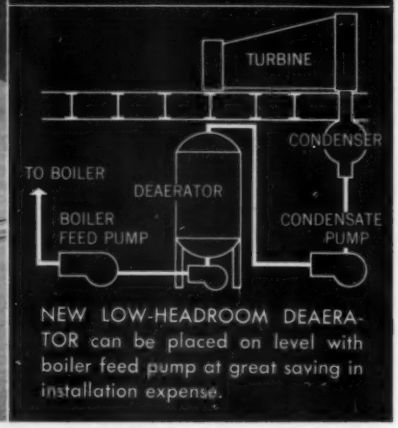

NEW LOW-HEADROOM DEAERATOR can be placed on level with boiler feed pump at great saving in installation expense.

New low-headroom deaerator makes oxygen removal economical for the smaller plant

Now every plant, large or small, can cut steam plant maintenance . . . and do it economically . . . by using deaerators. A new "low-headroom" deaerator, just developed by Worthington, allows you to install the unit *inside* your power house. You don't have to pay for expensive elevated mounting and complicated piping!

To provide adequate water pressure, it used to be necessary to elevate the deaerator above the boiler feed pump intake. A small pump on the new "low-headroom" unit now furnishes this pressure without the need for elevation. Result: considerable saving on installation and piping.

A patented* recirculation system prevents vapor-binding and provides means for preheating and deaeration before start-up. It gives you maximum oxygen removal even under abnormal operating conditions.

Available in standard sizes up to 80,000 pounds per hour, and larger in "tailored" designs, the new "low-headroom" deaerator can be installed in your plant in a matter of weeks. For more information call your nearest Worthington District Office or write Section S63, Worthington Corporation, Steam Power Department, Harrison, N. J. In Canada: Worthington (Canada) 1955, Ltd., Toronto, Ont.

S.6.3

WORTHINGTON

*Patent No. 2308719-20 & 21 2564583 — other patents pending

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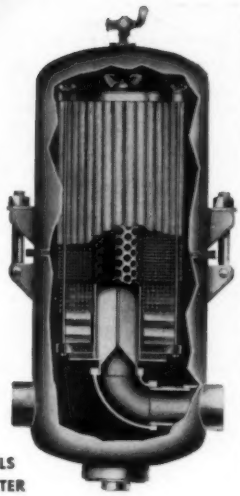
YOU NEED

STAYNEW LIQUID FILTERS



MODEL ELS
LIQUID FILTER

Name a liquid . . . any liquid! Somewhere in the world it is undoubtedly filtered efficiently and economically by a Staynew Liquid Filter. The world-wide use of Staynew Filters on thousands of liquids is proof of their adaptability to virtually any requirement. All known types of filtering media are available for any problem regardless of temperature, pressure, or corrosion factors. And, all Staynew Model ELS Liquid Filter bodies are available in steel, stainless steel, monel, herculoy and other non-corrosive materials. Construction can be according to ASME or API Code specifications. Let us know your requirements.

SOME OF THE LIQUIDS EFFICIENTLY FILTERED BY STAYNEW LIQUID FILTERS

- Acetone
- Acids
- Adhesives
- Alcohols
- Alkalis
- Ammonia
- Asphalt
- Benzene
- Benzine
- Beverages
- Butane
- Casein
- Castor Oil
- Caustic
- Cellulose Solutions
- Chlorine
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- Cleaning Fluids
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- Paint
- Pharmaceuticals
- Propylene
- Quenching Oils
- Resins
- Rubber Cements
- Sizing
- Soap
- Solvents
- Steam Condensate
- Syrups
- Tar
- Turpentine
- Varnish
- Vegetable Oils
- Viscose
- Water
- Wax

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WHAT'S NEW IN MOTOR CONTROL? ★ ★ ★ GET IT FIRST IN CUTLER-HAMMER

Now...A Safety Switch Built to the Standards of Cutler-Hammer Three-Star Motor Control

☆ *installs easier*

☆ *works better*

☆ *lasts longer*

New Bulletin 4105 Safety Switch Type A, 30 to 1200 Amp. Sizes

Engineered for "heat-proof" dependability. New design for minimum internal heat generation; new materials for heat immunity.

Automatic pressure fuse receivers; no screws to forget to tighten . . . no screws to loosen in service by alternate expansion and contraction.

Visible blades for quick and sure inspection at all times. New double insulated steel operating hook. Safety is important in safety switches.

Panel mounted mechanism of this new Bul. 4105 Safety Switch is readily interchangeable with that of the old Bul. 4101 to permit replacements without case and conduit work.

The new Cutler-Hammer Three-Star Motor Control has proved a sensation wherever it has been tested in comparison with any other control equipment. The tougher the tests, the more dramatic has been its demonstrated superiority. A kaolin processing plant in Georgia, for example, reports: "Because of the hard service we give motor control in our plant, we have always had to replace contacts every 30 to 60 days. Our first Three-Star Control unit has now been in daily use for *thirteen months* and its original contacts still look and work like new." A lumber mill in California says: "Control contacts have always been a problem on our drive of the feed chain going to the trim saw. We had to replace contacts every few weeks. Our first Three-Star Control on this job, purchased from the stock of our local Cutler-Hammer distributor, is now in its *twenty-fourth month* of continuous daily operation with its original contacts still in service."

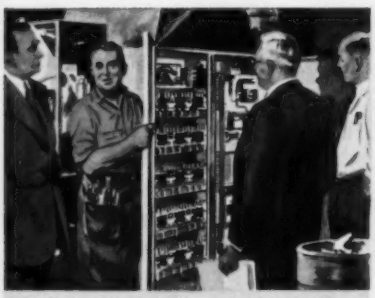
Such control equipment brings important operating dependability and savings to any job where an electric motor is used. But it also means that such better motor control should be matched with a safety switch which can equal the performance of the motor control. And now this is possible. Cutler-Hammer Authorized Distributors are now stocked and ready to serve you with the new Bul. 4105 Safety Switch, the safety switch built to the standards of Cutler-Hammer Three-Star Motor Control. It is loaded with new features. See it. Try it. Prove it. Order one today.

CUTLER-HAMMER, Inc., 1447 St. Paul Ave., Milwaukee 1, Wisconsin.

CUTLER-HAMMER ★ ★ ★ MOTOR CONTROL C-H

Cutler-Hammer Three-Star Motor Control can now be obtained in every needed form

Cutler-Hammer Authorized Distributors carry stocks of Three-Star Motor Control in sizes and types of enclosures to meet all the usual industrial needs.



Leading machinery builders equip their machines with Cutler-Hammer Three-Star Motor Control as standard original equipment, often as components on panels.

The new Cutler-Hammer Three-Star Unitrol provides for the quickest installation or rearrangement of the finest in control equipment, C-H Three-Star Motor Control.

For more facts circle 713 on Reply Card

MAY, 1956

Plant Engineering

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The magazine that helps plant engineers with their everyday problems